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Exploring engineering employability competencies through interpersonal and enterprise skills

Hasan, Hazmilah

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EXPLORING ENGINEERING EMPLOYABILITY COMPETENCIES THROUGH INTERPERSONAL AND ENTERPRISE SKILLS

Hazmilah Hasan

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ABSTRACT

Many researchers in engineering education have studied the engineering curriculum, employability, industrial training, generic skills and gender issues. From a wide spectrum of study, there is a gap around issues of interpersonal skills and enterprise skills in engineering education that has not been studied. Previous study has shown that there is unemployment amongst graduate engineers in Malaysia. This study aimed to assess whether the suggested lack of interpersonal and enterprise skills competencies cause unemployment amongst engineering graduates in Malaysia. This study also intended to appraise whether engineering undergraduates have received a quality work placement appropriate to their learning, knowledge and employability skills and also to create awareness about interpersonal and enterprise skills competencies amongst engineering undergraduates, higher education educators and employers in Malaysia. This study intended to create awareness about the importance of interpersonal and enterprise skills amongst engineers. A mixed method of questionnaire survey and interview was used to access data from final year engineering students and employers in Malaysia. Results from the study have provided evidence that interpersonal and enterprise skills are not a major contributor to unemployment of engineering graduates in Malaysia. This study has created new awareness of the subject that will allow the enhancement of the engineering education curriculum. This study has demonstrated that when interviewing companies for the purposes of research into curriculum it is necessary to have full awareness of their culture and ways of working.

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DECLARATION

Except where otherwise stated this thesis is the result of my own research and does not include the outcome of work done in collaboration. All sections of the text and results that have been obtained from other workers or sources are fully referenced. The research was conducted in Engineering Design Research Centre, Faculty of Engineering and Computing, Coventry University between June 2005 and June 2008. This thesis has not been submitted in whole or in part as consideration of any other degree or qualification at this University or any other Institute of Learning.

Hazmilah Hasan

In the name of Almighty od, the erciful,

the Compassionate

This work is dedicated to Almighty od

for giving me the opportunity, strength and

knowledge to complete the research for the

benefits of the mankind

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CHAPTER 1

INTRODUCTION

1.0 Introduction

Pressure on delivering quality transferable skills or generic skills to prospective engineering graduates has been a debate for some time both in the United Kingdom and also in Malaysia. Employers expect and demand good quality engineering graduates from higher education institutions. Therefore, these institutions, within their constraints, try to fulfil the high requirements of employers.

There are many studies regarding the appropriate approach to delivering the skills needed by employers or in the workplace (Harvey, 2001; Quek, 2005; Dench, 1997; Andersen, 2004) to the undergraduate but those dealing with individual capability are non exhaustive. There are also arguments on how to balance the academic curriculum and generic skills (Quek, 2005; Holden, et.al., 2004; Morse, 2006). However, both employers and academics have different terms, definitions and perceptions of generic skills (Dench, 1997,). With the contrasting opinions from both parties, the transfer of generic skills can be difficult.

It is suggested that both employers and universities have an important role in developing the skills needed in the workplace. The aim of this study is to demonstrate that the basic knowledge and skills provided by the university with an appropriate training package during industrial training will be useful to new graduate employees in the workplace.

1.1 The current situation for the skills agenda, universities and employers.

According to Skills Dialogues (2000), a range of new and specific technical skills is required to meet the demands of technology and of business. Also of importance is the greater emphasis employers put on personal and generic skills in all areas of work. The key role of managers and supervisors has become increasingly critical and requires a mixture of good quality technical and communication skills.

The engineering curriculum has been criticized (Skills Dialogue, 2000) for not developing personal and transferable skills sufficiently amongst graduates. Engineering graduates often opt for alternative jobs in non-related areas such as in IT leading to the failure of industry to use their acquired skills and knowledge and also a failure to further develop their engineering skill.

Employers have also reported other shortages in generic and interpersonal skills. For technicians, IT and software skills are frequently mentioned, whilst among managers there appear to be difficulties finding people with good management skills. For craft, management and sales occupations, communications skills are also a problem (Skills Dialogue, 2000; National Employers Survey, 2003).

Universities and the relevant authorities involved in engineering graduate development have to emphasize practical and technical skills, and also need to take into consideration personal and generic skills. Andersen (2004) supports this by suggesting that the engineers of tomorrow will need more than technical skills to work in international teams across borders. Working in integrated engineering contexts emphasizes the development of personal and professional competencies, especially the ability to work and communicate within cross-cultural project groups (Chojnacha et.al, 2000). Further it involves the interrelated work of several disciplines.

Davies, et.al., (2006) in the study of what makes a good engineering lecturer, provide a useful reference point of discussion about what engineering students actually want from their lecturers. The analysis has identified three attributes which identify a good lecturer is; enthusiastic, gives clear, well-structured presentations and uses real-world engineering examples backed up by industrial experience. This can be used as guidance for engineering educators or young lecturers to measure them to see whether they match the criteria or they should undergo training for development as engineering lecturer.

1.2 The importance of skills development

In addressing the importance of interpersonal and enterprise skills development, there are industry cases that demonstrate the need to improve the related skills. There is a high failure rate of new product development (NPD) reported by Balachandra and Friar

(1997) who stated that almost 90 % of products introduced in 1991 did not reach their business objectives. Schilling and Hill (1998) quoted that between 33 % and 60 % of all new products in North America that reach the market fail to generate an economic return. Meanwhile, Cooper (2005) quoted 33% failure rate of NPD projects. At any rate, making NPD projects successful has been a major challenge for the manager in the past and will undoubtedly continue to be a major challenge for tomorrow's manager (Souder and Sherman, 1994). One of the factors that contribute to this is people management issues (Yahya et. al, 2007).

According to Yahya et.al. (2007) NPD people management issues include those of human resource management (e.g. hiring, compensation, motivation and resignation), competency (e.g. training, organizational learning), job performance (e.g. work load, goal setting) and supportive environments (e.g. norms, working conditions, reward). The consequences of a NPD people management issue may lead to a more severe impact on the capacity to plan and execute NPD projects.

Yahya in his study regarding NPD management issues and decision-making approaches says that, senior managers consistently make use of their managerial and supervisory skills, creative problem solving and organizational rules to make credible decisions in dealing with NPD people management issues. Decision making process involves consideration for NPD project or resource prioritization and reassignment of project tasks to the remaining or existing staffs.

NPD people management issues are "soft" issues that are related to human factors and organizational aspects and thus have significant impact on the capacity to plan and execute NPD projects. Trying to do too many NPD projects within a limited resource without clear prioritization is another common NPD people management issue (Cooper and Edgett, 2003). Except for the fact that they have significant impact specifically on NPD projects, NPD people management issues are basically similar to other non-NPD organizational management issues for example using managerial and supervisory skills, creative problem solving and organizational rules are found as common practical decision making approaches taken by the senior managers.

Supply chain management as a field of business also has difficulties and the need for interpersonal skills and enterprise skills. According to Kim (2006) supply chain management seeks to enhance competitive performance by closely integrating the internal functions within a company and effectively linking them with the external operations of suppliers, customers and other channel members. The benefits of supply chain integration can be attained through efficient linkage among various supply chain activities and the linkage should be subject to the construction and utilization of various supply chain practices for an integrated supply chain.

Supply chain management emerged in the late 1990s and the beginning of this millennium as a source for sustainable competitive advantage for companies (Dell and Fredman, 1999). It involves functions such as production, purchasing, materials management, warehousing and inventory control, distribution, shipping and transport logistics. To attain sustainable competitiveness in these functions, effective coordination among the players representing these functions in the supply chain is required. The effectiveness of coordination in supply chains can be measured in two ways: reduction in total supply costs and enhanced coordination services provided to the end customer, and to all players in the supply chain (Pagel, 1999). Failure of coordination amongst respective parties of the supply chain would significantly result in production interruptions (Saadany et al., 2007). Therefore, coordination amongst respective supply chain parties is crucial to eliminate the waste of time and money.

In the construction industry, effective communication is a fundamental factor that construction alliances must implement for project success. The construction industry is considered to be divided and fragmented, where construction parties pay attention to conforming to contractual requirements. Since these parties represent different professions including architecture, structural engineering, quantity surveying, civil engineering, project management, building surveying, etc., their multidisciplinary skills limits the scope of cooperation between them. The significant reason for this lies with problems in communication. Some common examples are not having open lines of communication (protocols), inappropriate communication channels (inefficient and/or ineffective) and unexpected communication breakdown (Cheng et al., 2001). Because of these factors, there is a need to pursue the study of interpersonal and enterprise skills amongst engineering graduates.

1.3 Status of unemployment amongst Malaysian engineering graduates

An online survey done by the National Economic Action Council (MTEN) in 2006 reported that out of 7,370 graduates in the engineering field who responded to an online survey only 4,035 were working and 3,335 were unemployed. It is important to note that in Malaysia access to the internet is very limited particularly in poor, rural and isolated regions. Internet installation in their homes can be very expensive for many Malaysians. Cyber café's normally provide relatively cheap but restrictive access. Therefore, the number of engineering graduates responses is not representative of the whole population of engineering graduates educated in the Malaysian higher education institutions (HEI).

The survey reported that 56.8% of engineering graduates are male. Of those who participated in the online survey, about 23.7% were from the mechanical field, 23.7% were civil engineers, 16.8% from the electrical field, 16% from electronic and telecommunication field and 19.8% from other fields.

The online survey reported that 80.7% were engineering graduates from Malaysian state HE, 17.4% were engineering graduates from private HE in Malaysia and 1.9% were engineering graduates from overseas HE.

70.3% of the engineering graduates achieved a Diploma while 28.3% obtained Bachelor's degrees. Only 0.9% was of PhD level and 0.4% has another level. This study will only focus on the engineering graduates with degrees as they are qualified to take up employment in supervisory, managerial and generally higher positions.

The Malaysian government tried to provide a working experience to the unemployed engineering graduates through the Attachment and Training Scheme (SSL) but only 9.5% have actually undertaken the scheme.

In Malaysia it is generally assumed that an engineering graduate can easily gain employment because of their professional status as compared to graduates from the arts. It is suggested that they should not have any difficulty to be employed compare to the non-engineering graduates. The survey indicated otherwise, where 67.1% of engineering graduates have a waiting period of less than 3 months to be employed, 14.3 % wait for about 6 months in a period of unemployment and in some cases more than 6 months.

There are many causes of unemployment amongst the engineering graduate group. This study intends to explore whether the suggested lack of interpersonal and enterprise skills that contribute to the unemployment of the engineering graduates in Malaysia.

1.3.1 **Government strategies to resolve unemployment**

The Malaysian government has taken several measures to address unemployment amongst graduates. In steering the nation out of the financial crisis, the National Economic Action Council (NEAC) has outlined six objectives that include

i. stabilizing the Ringgit (Malaysian currency) ;

ii. restoring market confidence;

iii. maintaining financial stability;

iv. strengthening economic fundamentals;

v. continuing the equity and socio economic agenda; and

vi. restoring adversely affected sectors.

As for measures undertaken to address graduate unemployment, it falls under the fifth objective of reinforcing the government's equity and socio-economic agenda.

The following programme was specifically tailored for graduates in 2001:

a. Programmes and government financial assistance and incentives;
    - Training Scheme for Graduates in ICT and Languages
    - The fees were paid by the government as financial assistance and incentives to unemployed graduates to improve their weaknesses in language especially in English language and additional skills in ICT.
b. Attachment and Training Scheme for Unemployed Graduates
    i. Further Study Scheme- provides loans
    ii. Attachment and Training Scheme (SSL) – 6 months in government agencies.
c. Attachment as assistant lecturers
    - These schemes provide a working allowance and loans facility for further study.
d. Attachment Scheme for Conducting Study

- This scheme provides working experience for unemployed graduates for 6 months in government offices.

e. Commercial Agriculture Entrepreneur Attachment Scheme

- This scheme attached unemployed graduates to successful commercial agricultural producers.

f. Private Attachment Scheme

- This scheme provides 6 months training in private companies especially in engineering architecture and surveying.

g. Attachment programme to upgrade small medium enterprise (EKS) ability in ICT.

The Malaysian government added more programmes in 2002 in an attempt to address the unemployment issues amongst graduates.

a. Retraining fund of RM100 million (GBP 14.3 million) for new graduates in selected fields such as ICT and Accountancy.
b. Training Scheme of 1-2 years with government owned companies.

Generally, the programmes tend to address the cyclical nature of unemployment (when the economy is booming, there will be lots of demand and so firms will be employing large numbers of workers but when the economy slows down, it becomes vice-versa) and attempts to address structural unemployment (involving a mismatch between workers looking for jobs and the vacancies available), by providing, some basic skills of language, communication and additional skills such as use of computers; it is hoped that the unemployed graduates are ready to be absorbed into the job market within a short period provided the economy shows signs of recovery.

Since the economy was still unable to create enough jobs, the graduates have to accept whatever job is available and thus structural unemployment continues. To the public, the graduate is still unemployed. Through the entrepreneur schemes, it is hoped to create entrepreneurs who later will become job creators.

With reference to the economic crisis and other factors that affect the unemployment of engineering graduates as mentioned earlier, this study will further investigate whether the suggested lack of interpersonal skills and enterprise skills (New Sunday Times, 2002) has any correlation with the unemployment of engineering graduates in Malaysia. Thus, has the employer transferred quality industrial training to the engineering graduate?

1.4 Aims and scope of research

The aim of this study is to explore whether the suggested lack of interpersonal and enterprise skills competencies cause unemployment amongst engineering graduates in Malaysia. The researcher intended to gain information and appraise whether engineering undergraduates have received a quality work placement (appropriate to their learning, knowledge and employability skills) and to the needs of the workplace. The researchers' interest is to examine the extent of the engineering programme, industrial training and university life and co-curriculum activities offered to engineering students. Do these schemes help to promote interpersonal skills and entrepreneurial skills towards employability?

This research tries to measure the university programme, industrial training and university life and co-curriculum activity impact on the engineering undergraduates' interpersonal skill and enterprise skill. Do the engineering students interpersonal and enterprise skills develop and increase through all the activity imposed on them?

The researcher considering employing a mixed method technique, the researcher will utilize a questionnaire survey and interview approach to explore the situation under study. Probably the quantitative and qualitative findings will be triangulated to provide greater rigour in the findings.

1.5 Significance of findings

This study intended to provide not only profiles of interpersonal and enterprise skills practices amongst engineering undergraduates but will also consider the impact of the Generic Transfer Questionnaire (GTQ) a combination of adopted framework of Course Experience Questionnaire (CEQ) (Ramsden, 1991b) and the generic skills criteria for workplace study (Harvey, 2001) as generic skills measurement tool. This will be discussed in more detail in Chapter 3. This study will be of value to engineering students, their parents, curriculum developers from government and private Higher

Education Institutions (HEI), HEI educators, employers, and most importantly the Ministry of Higher Education.

As an early years communication educator at the University Technical Malaysia Melaka (UTEM), the researcher is in a good position to ensure that this study will benefit HE engineering educators particularly involved in interpersonal and enterprise skills development, as it will increase their awareness through conference and journal papers, workshops and seminars of the importance of the educator-pupil interaction and how they may have influenced the students' learning and enable them to modify their teaching strategies accordingly to accommodate their learning. It will be important for improving higher education educators in the country and it will also benefit the engineering education curriculum developers and policy makers, as they are responsible for the future development of higher institution and engineering curriculum in Malaysia.

The research method, process and findings of this study too will add to the body of knowledge in this field. As has been illustrated above the literature in this specific field is limited. Most research done previously in the area of curriculum, general generic skills, communication and limited on interpersonal and enterprise skills or uses either qualitative or quantitative methods. This study intends to use a mixed-method and the strength of this study is in the triangulation technique.

CHAPTER 2

LITERATURE, PRACTICE AND ISSUES IN ENGINEERING EDUCATION

2.0 Overview

The aim of this study is to explore whether the suggested lack of interpersonal and enterprise skills competencies cause unemployment amongst engineering graduates in Malaysia. This study intended to gain information and appraise whether engineering undergraduates have received a quality work placement appropriate to their learning, knowledge and employability skills and to the needs of the workplace. This chapter will consider the related literature and explore the status of the engineering graduate, the role of the university and consider if the skills acquired by the employee are relevant to the workplace. In this chapter too, the researcher will compare engineering degree requirements at a global level, comparing engineering education in some developing countries and issues associated with it. The researcher will explore approaches taken to enhance generic skills generally, and more specifically interpersonal and enterprise skills.

Higher institutions are expected and assumed not only to educate undergraduates but also to ensure that graduates will be employed after they have graduated. There are a number approaches taken by HEIs to enhance the employability skills but should they solely shoulder this responsibility? How about the employer? Should they be pointing fingers, blaming the other party if the graduate outcome does not match the work market? There are several things needed to be considered in discussing employability competency. This chapter will look into engineering in terms of definition, type of engineering, skills related to engineering practices and skills gaps or deficiencies, employer needs, employability, the role of HEIs, policy towards generic skills, interpersonal skills, enterprise skills, gender issues and approaches towards the development of generic skills of engineering undergraduates.

2.1 Engineering

2.1.1 Definition of engineering

> According to Barker, (1993), engineering is:
> "the art of directing the great sources of power in nature for the use and the convenience of humans. In its modern form engineering involves people, money, materials, machines and energy. The difference between a scientist and an engineer is that a scientist discovers and formulates into acceptable theories, whereby an engineer requires the creative imagination to innovate useful applications of natural phenomena".

Therefore, to improve the standard of living and to diminish toil, engineers always look for newer, cheaper, better usage of energy from natural sources and materials.

2.1.2 Types of engineering.

There are various disciplines in engineering, civil engineering is concerned with static structures such as dams, bridges, and buildings. According to Barker (1993), mechanical engineering specialized on machinery and engines. Mining engineering is concerned with the discovery of and removal from geological structures of metalliferous ore bodies, whereas metallurgical engineering is involved in the extraction and refinement of metals from the ores. Electrical and chemical engineering emerge from the practical applications of electricity and chemistry.

The intensive processes in civil engineering have evolved into more specialized engineers such as structural engineers, dam engineers, water-power engineers, bridge engineers, mechanical engineers as machine-design engineers, industrial engineers, motive-power engineers, electrical engineers as power and communication engineers (and the latter divided eventually into telegraph, telephone, radio, television and radar engineers, whereas the power engineers divided into fossil-fuel and nuclear engineers); mining engineers as metallic-ore mining engineers and fossil-fuel mining engineers (latter divided into coal and petroleum engineers). The increasing complexity of specialized machines and their integrated utilization in automated processes has resulted in physical and mental challenges for the operating personnel. This has resulted in the introduction of bioengineering, concerned with the physical effects on humans and engineering management, concerned with mental effects.

2.1.3 Skills related to engineering practice.

It is estimated that 2.5 million people (Skills Dialogue, 2000, and National

Employers Skills Survey, 2003) are employed in engineering occupations. Engineering skills are in demand across the United Kingdom employability market. Although the engineering industry has shrunk, it still showed a small increase of 5 % between 1995 and 1998. This is considered a leaner but fitter industry, with both productivity and output increasing in the 1990s.

Rapid changes and diversity in industry has implication for skills. Lots of emerging companies are small firms rather than large firms because of downsizing. Companies are looking at out-sourcing. Work responsibilities are numerous at the higher level and also complex, requiring a mixture of skills. Suppliers and customers' relationships are becoming more challenging. Operational and investment decisions are aimed at a global level. Therefore, employers are demanding more highly-skilled and educated employees to help them deal with the rapid economic change and to maintain their market position.

In the UK economy, the electronic sector is the fastest growing and best performing sector. The weakest performers are the metals manufacturing, molding and fabrication sectors. Skills requirements are also subject to industry demands and pressures. The skills requirement and employment pattern for electronic sectors are different from other engineering sectors. Between 1998 and 2004, there was a 13% reduction in employment levels in the engineering manufacturing sector. According to (Skills Dialogues, 2000), employment of engineering professionals was forecast to grow by over 2% per annum to 2009 while a 2% annual reduction was forecast in the employment of engineering craft and metal working skilled trades.

Failure to match employers' requirements forced trained engineers to drive taxi cabs in Toronto. According to the Ontario Society of Professional Engineers (OSPE) too many engineers in densely populated cities are without the right skill set and qualifications causing them to accept mis-matched jobs (Monette, 2007).

2.1.4 The engineer's nature of work.

Getting a new product into the market is more than just having a few parts made. It is done through a process called "Product Development". The process starts with the needs from customer, to having the bright idea to having the desirable product in hand. Development of the bright idea into a final product is a process involving thinking through issues and adaptations, working out details and specifications- like how can it be made, the exact materials, possible failure modes, required regulations and more.

In 1916, Fayol (1949) wrote General and Industrial Management in which management was described as a process consisting of planning, organization, coordinating, directing and controlling. It indicated that the concerns of strategy were effectiveness (ensuring that the organization is doing the right thing) whereas the concerns of operations were efficiency (doing things right).

Winner et.al. (1998), defined concurrent engineering as 'a systematic approach to the integrated, concurrent design of products and their related processes, including manufacturing and support'. This approach is intended to cause the developer from the outset, to consider all elements of the product life cycle from conception through disposal including quality, cost, schedule and user requirements.

Handfield (1994) indicated that the central point of concurrent engineering is the reduction of product development lead time, which is achieved by collapsing activities so they are completed concurrently rather than sequentially. Ainscough and Yazdine (1999) viewed concurrent engineering as an initiative that can enable a company to reduce the time in which it designs, develops and introduces a product to the market by executing each phase of the product development process in parallel.

Coordination in engineering has been observed as an important and pervasive characteristic within a number of interpretations of approaches to engineering management; for example, models of the engineering design process (Ray, 1985 and Cross, 1994), concurrent engineering (Duffy et.al., 1993, McCord and Eppinger, 1993, Prasad, 1996, Perrin, 1997, Coates et. al 1999a) and project management (Oberlender, 1993, Bailetti et.al., 1994, Cleetus et.al 1996, Lock, 1996). Indeed, coordination has been identified as being significant in several other approaches such as work flow management (Alonso et.al, 1996, Yu, 1996, Piccinelli 1998 and Shan 1999), design integration (Hansen, 1995) and computer-supported cooperative work (Malone and Crowston, 1994, Schal, 1996). In any coordinated work, a lot of communication is needed. Therefore, interpersonal skill is important to maintain coordination and work flow amongst engineers (Coates, 2004).

In the context of concurrent engineering, coordination has been described as the vehicle for its realization (Duffy et.al., 1993), a main challenge (McCord and Eppinger, 1993) and the principal requirement for its successful implementation (Coates et. al. 1999a). Prasad (1996) identified coordination as an element of cooperative teams within concurrent engineering organizations.

With regard to project management, Bailetti et.al (1994) viewed coordination as an important factor in differentiating successful and unsuccessful projects, with performance in product development described as being linked to a higher degree of coordination. Oberlender (1993) defined project management as ‘the art and science of coordinating their efforts in a common direction to bring a project team of people, equipment, materials, money and schedules to complete a specified project on time and within approved cost’, and as such the duty of the project manager was described as organizing a project team of people and coordinating their efforts in a common direction to bring a project to successful completion. It was also stated that coordination could be achieved through effective communication, specifically at regularly scheduled team meetings. Bendeck et.al (1998) implied that coordination could be achieved by providing a notification mechanism that keeps all team members up to date on the current state of the project. Lock (1996) indicated that project management involves planning, coordinating, and controlling the complex and diverse activities of modern industrial projects, causing much of a project manager's time to be spent coordinating, which was described as steering and integrating the activities of some departments whilst relying on others for information and supporting services.

Cleetus et al., (1996) stated that, previously, much emphasis in project management had been placed solely on management. It was implied that rather than having control of management by one person, the objective should be coordination among people engaged in tasks. Coordination was said to be brought by communication and responsible workers knowing about the completion of tasks on which they are dependent. This is supported by Duffy et al. (1999) who stated that 'a more relevant, comprehensive and appropriate approach is required for optimum performance and thus, suggested design coordination as such an approach. Similarly, Andreason, et. al. (1996) identified that the effective coordination of the design process is the key to achieving optimal design performance.

Kerno, S., (2007) suggests that an engineer must be able to define and clearly articulate the nature and scope of current and future project assignments, as opposed to individual jobs. As work becomes more project-oriented, engineering career success will increasingly depend on the ability to move from project to project and to absorb the learning and "best practices" from each assignment, as opposed to retaining a relatively static job title and work environment.

Kerno also suggested that to avoid career threats engineers must stay very well connected, not only with other engineers, but with professionals in adjacent and even unrelated fields (human resources, marketing, finance, accounting, etc.). These occupations face similar career threats, but in different ways. They may have unique and fresh career insights for the engineer or even better; know of a position for which the individual is perfect. Therefore, interpersonal and enterprise skills development amongst engineering graduates is important for engineering career development. Thus, this highlights the need to pursue this study.

2.1.5 The skills gap in engineering.

The skills gap or skills deficiencies are problems in filling vacancies due to a shortage of people with the relevant skills and experience, (Skills Dialogues, 2000). There is evidence from engineering employers that they have difficulty in filling the vacancies with related skills and there are also areas of skills deficiency within the existing engineering workforce.

Employers commonly have hard-to-fill vacancies in the engineering areas such as craft, technician, professional and managerial occupations. It is understood, that two-thirds of all vacancies at craft and skilled operative level are hard-to-fill ones. The National Employers Skills Survey, (2003), reported 270,000 unfilled vacancies that were described as hard to fill by respondents (approximately 40%) compared to that in 2001, the corresponding figure was 47 %. Over half of all vacancies at engineering professional level came from design and electrical engineers as well as in the craft and technical field.

A survey conducted by the Information Technology Governance Institute (ITGI) focusing on information technology employees reported that 700 chief executives and chief information officers at companies in 23 countries, including the UK found that 38% reported problems relating to inadequate skills in the workforce (Ashford, 2008).

Employers in engineering firms experienced more difficulties in filling vacancies at a professional engineering level, than other firms in the wider economy, due to a shortage of people with the relevant skills and experience than due to other reasons. The National Employers Skills Survey, (2003), reported, of the total of 271,000 hard-to-fill vacancies, 135,000 were due to skill shortages in that they were explicitly attributed to a lack of job applicants with the required skills, qualifications or work experience.

It is reported by engineering employers that it is more difficult to recruit people with technical and practical skills than other skills. These technical skills are often used generic terms, such as electrical and design.

One in four engineering employers considers there is a gap between the skills of their current workforce and those needed to meet their business objectives. The skills gaps mirror difficulties for those involved in recruitment. They have to emphasize practical and technical skills, and also to take into consideration personal and generic skills. People management skills are seen to be very important at all levels, as commonly reported.

The Malaysian Employers Federation (MEF) in their presentation "Facing the realities of the world of work", reported that the job market is oversupplied with young and inexperienced graduates from arts and social science degrees which are less in demand by private companies. Companies need more science and technical graduates and these new graduates are not meeting industry needs.

Finally, skills gaps or skills deficiencies have an impact on engineering companies in various ways: in promoting new product to market, developing business, the ability to meet customer demand, service and quality objectives and operating costs. Failure to narrow down the skills gaps will lead to a negative impact on the business opportunity made by engineering employers in a competitive global market.

The skills gap in workplace needs to be resolved. Why do engineering graduates not fit the skills gap identified by industry? Have the universities failed to transfer those skills needed by the workplace to the students? Therefore, an investigation is required to determine the situation. This study aims to investigate the transferable skills through both students' and employers' perspectives.

2.2 Employability competencies.

2.2.1 Definition of employability

According to Harvey, 2001, employability can be understood as the propensity of students to obtain a job or the possession of basic 'core skills', or an extended set of generic attributes that a type of employer (discipline-linked, sector-related, company-type) specifies.

However, Civelli, (1998) defined employability as the possibility to use or employ a series of competencies and knowledge in new or different areas of organizations by an individual or organization. Therefore, it is understood that to be employed, people have to have knowledge, skills and experience which can be certified by a qualification. There are also jobs that do not need any qualifications but the worker can show their competencies in the duties given, these are often lower skilled job. Unfortunately, a degree does not guarantee a job to any graduate today.

Hillage and Pollard (1998) also make an important point for a person to be able to make the most of their "employability assets", a lot depends on their personal circumstances (for example family responsibilities) and external factors (for example current level of opportunity within the labour market).

Bennett et.al., (1999) proposed a model provision in higher education which included five elements: i) disciplinary content knowledge; ii) disciplinary skills; iii) workplace awareness; iv) workplace experience; and v) generic skills. This model goes some way towards including all the necessary elements to ensure a graduate achieves an optimum level of employability, but is still missing some vital elements.

The USEM account of employability (Yorke, et.al., 2004) is probably the most well known and respected model in this field. USEM is an acronym for four inter-related components of employability: i) understanding; ii) skills; iii) efficacy beliefs and iv)metacognition. This model forms part of large body of research-based scholarly work on employability. However, this strength could also be perceived as a weakness, in that it does not assist in explaining to non-experts in the field, particularly the students themselves and their parents, exactly what is meant by employability.

The Centre for Employability (CfE) at the University of Central Lancashire (UCLan) in the UK has been developing practical solutions to enhance the prospects of students and graduates for over ten years. The main theoretical model that has underpinned this work has been the DOTS model (Law and Watts, 1977) which consists of:

Decision learning - decision making skills,

Opportunity awareness - knowing what work opportunities exist and what their requirements are,

Transition learning - including job searching and self presenting skills

Self awareness - in terms of interests, abilities, values, etc. (Watts, 2006).

The value of this model lies in its simplicity, as it allows individuals to organize a great deal of the complexity of career development learning into a manageable framework. However, the model has recently attracted some criticism. McCash (2006) argues that the model is over-reliant on a mechanistic matching of person and environment and therefore underplays other critical issues such as social and political contexts. He also points out that there is an implication that failure to secure a "self-fulfilling" occupation can be presented or experienced as the fault of the unsuccessful individual. These criticisms overlook the fact that the elegant simplicity of the DOTS model is precisely why it has proved so enduring and popular. They also seem to suggest that students introduced to basic concepts of career development through DOTS would be incapable of developing and learning about more sophisticated analyses through this simple introductory structure.

The concerns raised in the CfE about DOTS in relation to employability are different. For some time, it has become evident that the model has shortcomings when it is applied beyond careers education to the broader concept of employability. An early effort to capture the CfE definition of employability was reported in Hinchcliffe (2001, p.8):

> "Reflecting the range of views we see Peter Sewell of the CLASS Faculty Centre for Employability making the career development case and defining employability as: Having a set of skills, knowledge and personal attributes that make a person more likely to secure and be successful in their chosen occupation".

The most recent articulation of this, which incorporates an important additional new element of "satisfaction", stems from the recognition that from an individual's perspective a person may be successful in their chosen occupation but not necessarily satisfied:

> "Employability is having a set of skills, knowledge, understanding and personal attributes that make a person more likely to choose and secure occupations in which they can be satisfied and successful".
>
> Source: Hinchcliffe, (2001).

This definition has been used as a starting point from which to develop a new theoretical and practical framework for employability called "The Key to Employability" model (Pool, et.al., 2007). This model provides a clear, visual answer to the simple question of what employability is. They claimed that this model has the benefit of not only articulating the concept of employability in a theoretically rigorous manner, but doing so in a way that is easily accessible to both practitioners and students. The mnemonic (recalling significant facts or conveying general meanings) "CareerEDGE" is used as an aid to remember the five components on the lower tier of the model which consists of:

i) **Career**- Development Learning;

ii) **E**xperience (work & life);

iii) **D**egree- subject knowledge, understanding & skills;

iv) **G**eneric skills;

v) **E**motional intelligence.

It also claimed to open up new opportunities for the development of assessment tools and research into the impact of various employability interventions. However, the researcher feels that this model is too ambitious. In the contexts of students learning within 3 or 4 years, can they manage to transfer all the components required by the model? Pool and Sewell do not add another component to the model which is lifelong learning. Employability is a lifelong issue. Therefore, to acquire all the skills needed in the key to employability model, everyone needs the help of lifelong learning, to upgrade personal deficiencies exposed by the needs of work and changes in the economy.

Knight, (2001) mentioned in his paper that Louise Morley has pointed out that human-capital theories have such an intuitive and powerful hold that a government that failed to press higher education to do its utmost to enhance graduate employability would be seen to be negligent of national well-being. The impact of HEI failure to impart the right knowledge and fulfill the employability needs is a big loss for the country of effective utilization of 'human capital' (Dawkins, 1987). Therefore, alternative solutions are sought to enhance the employability amongst the undergraduates. In relating this to engineering graduates, most of their duties or tasks are in administration and supervision (Tahira, 2005). Therefore, personal and interpersonal approaches are important examples that people should possess. They should have their own set of competencies and knowledge in working with other people.

The world of employment is also changing rapidly. Permanence is no longer a significant feature: traditional career paths have disappeared, entire industries have relocated to other areas of the world, new technologies have made established practice and experience irrelevant (Fallows, et.al., 2000).

2.2.2 Employability and curriculum.

Zakaria et.al., (2006) in their research aim to present the Malaysian quantity surveying education framework and whether the scope of the syllabus in quantity surveying courses in Malaysian higher education fulfills the industry needs. Findings show that employers indicate that students' level of knowledge is the highest requirement, the second and third highest ranks are English for professionals and communication and proficiency skills in English. This study also shows that all respondents agreed that industrial training is important and highly beneficial to students. They also agreed the most appropriate duration for industrial training is 3 to 6 months and the ideal time frame is between semesters of their programme. 68% of respondents perceived the course offered was up-to-date with industry while, 58% rated the course offered at 50%-70% relevant. From this study, the researcher found that communication is important in the engineering profession but this study has not indicated the specific type of communication. Therefore, there is a need to further this study.

Kaur (2007), aimed in his study to ascertain the undergraduates' perceptions of knowledge, skills, and personal development in a Malaysian university using the Australian Course Experience Questionnaire (CEQ). Kaur tried to ascertain students' ratings on the Australian CEQ focusing on generic skills. This study reported that the highest scale was the ability to work as team members and the lowest was the capacity to tackle unfamiliar problems. It also found that the Malaysian students have improved their written communication skills. But this study did not include the credibility in oral/interpersonal communication and creative or innovation skills as can be found in enterprise skills in the rest of the study. These are the skills needed by employers in the new economic changes. The weaknesses in this study have given feedback to the researcher to pursue further study in the areas not covered.

Other study of soft skills transferred in engineering classes in United States (Kumar, 2007) found that implementation of problem-based learning in the curriculum and service-learning pedagogy in engineering is the most effective way to prepare engineers for the 21st Century. Students performing service-learning are not doing something for the community but with the community (Lime, et. al., 2006). It involved integration of community, practicing firms, students and their university faculty. This study focuses on planting leadership skills in engineering classes and uses Accreditation Board for Engineering and Technology (ABET)'s engineering criteria 2000 as benchmark to the criteria needed in an engineering leader. Time constraints were mentioned as part of the obstacle in the success of the approach chosen. Other findings were that implementation requires lots of commitment and dedication from everybody involved and needs modification of the teaching style. The researcher interested with the approach of teaching soft skills through problem based learning and service-learning with community would be an enhancement to add value to the Malaysian engineering education curriculum. Through the researcher observation, the Malaysian engineering education curriculum did include the working with community in universities but as society activities and not as a part of the engineering curriculum. The researcher found also that interpersonal communication is imbedded in leadership skills. It shows the importance of interpersonal skills to an engineering leader or administrator. This study had over looked this matter. Thus, it is important, that the researcher proceed with the intention to explore the importance of interpersonal skills and enterprise skills to engineers.

In another study related to the engineering curriculum, Vanasupa, et.al., (2006) used global issues to raise awareness of the needs and the engineer's role in society and how it can be converted into action on the part of the engineering practitioners by guiding principles. Examples of how they used them in courses are given. The findings suggest that in order to promote social responsibility, the engineering curriculum must go beyond the focus on technical skills. This study has identified 5 principles that can be communicated in the natural course of engineering curricula; 1. everything is connected; 2. the earth is a closed thermodynamic system; 3. make responsible choices early in the design phase; 4. the sun is the earth's energy source and 5. optimize rather than maximize. Their preliminary result shows that students exposed to these principles show a shift toward a greater awareness of social responsibility. This study did not highlight any improvement in interpersonal or enterprise skills.

Similar to this study Kahn, et.al., (2007) conducted research at the Imperial College, London on an evaluation of the effectiveness of the partnership between developing technologies and the development of professionals, looking at its role in educating students for development work. The focus of this study is how to ensure fairness to students who are pursuing lines of inquiry that involve varying levels of challenge and the connection between the underlying basis for an enquiry and student motivation through sustainable solutions that are designed to tackle global poverty. This study tried to look at what engineers can contribute to the community especially for poor or developing countries.

In another related study, Haselbach, et.al., (2008) describes and reports the effectiveness of one attempt to infuse the delivery of traditional core curricula with strategies that facilitate their students' understanding of the complex interactions of real-world engineered systems (interrelationships between engineered, technical, and non-technical; i.e.; social or environmental) within the context of civil engineering and land development education. The results of this study indicate that the mixed teaching style and varied class assignments in the course under investigation did significantly contribute to students' understanding and introduction to complex systems as related to engineering and construction, particularly in land development. These three similar studies do not relate to interpersonal communication or enterprise skills as the researcher aimed to investigate. However, he relates his findings to social responsibility and environmental ethics in engineering. Maybe these skills are needed by future employers, as previous researchers have highlighted these issues.

According to a Malaysian proverb, you will find it easier to bend a shoot, than to bend a bamboo cane. This means that it is better to start teaching a child at a very young age rather than when they are older. This is because at an older age, they will not easily obey instructions and the worst part is that they may not want to be taught anything. This proverb is related with the interview in this article whose title is, what will it take to establish engineering education for all students (The Technology Teacher, 2008)? The interviewee, Sneider, of the National Center for Technological Literacy at the Museum of Science, Boston, stated that the Massachusetts Science and Technology/Engineering Curriculum Framework includes standards to promote technological literacy at all grade levels especially K-12. This article found that to expand technology and engineering education in other schools or states, it is important that more people are open to arguments in support of technology education at all levels. It is also good in terms of technology that teachers can help to clarify a common confusion about the meaning technology and technological literacy at an early stage as similar to skills terminology debate later in section 2.5.1.

HEI's are trying to provide undergraduates with the nearest or similar to on-job syllabus but unfortunately, project working, as an employability-enhancing activity, for example, range from employability-linked, problem-solving team projects to academic projects and are rarely connected to the world of work, (Harvey, 2001). Therefore, it is not an easy job to demonstrate and practice the real on the job situation in a class environment. Bowden and Masters, (1993) agreed by stating that there is ample evidence that students in the classroom do not 'transfer' knowledge developed in solving the classroom assignment to the professional situation they meet in the field, or to the practical problem they meet in their day-to-day life (Tempone and Martin, 2003). Many writers assert that students have difficulty in transferring theoretical concepts acquired in the classroom to practical applications in the workplace in areas as varied as aviation, psychology, accounting and mathematics (Crebbin, 1997; Wiggin, 1997; Yap, 1997; Yasukawa, 1997). The researcher found that there are debates on what, and how to provide the best way to transmit soft skills to students. From the research observation and literature, it is still an on going debate. The decision relates to the debates involved in the changing of the economy with the change in producing and manufacturing a product and also there is a change in demand of the skills involved.

Often there are complaints and demands that universities should prepare their students with knowledge and employability skills (Tempone and Martin, 2003). According to Tempone and Martin, there are debates on generic skills or transferable skills on defining and validating transferable skills in higher education, with a further issue being the curriculum through which transferable skills best be developed in students (Blumhof et al., 1994; Bridges, 1994; Star, 1994). Transferable skills are seen to be those applicable across differing cognitive domains or social situations, while curriculum selection relates to the generalizability possible from a wide range of curriculum choices (Bridges, 1994).

In support, Chadha, (2006) highlighted two issues in the skills debate which are first, recognizing the value of skills and the second is developing the methodologies to teach them effectively. Therefore, this study presents a model of curriculum development which can be used to develop transferable skills effectively. The model was developed from chemical engineering education. A mixed method such as questionnaires, focus group, one-to-one interviews and mind mapping exercises regarding the students' transferable skills development was applied. Unfortunately, this study fails to establish a clear pathway for applying these approaches successfully.

The researcher agrees with Ramsdens' statement, "the challenge for the academic staff is to find a way or change or add what is taught, ensure the qualities are clearly desirable without overloading the students with too much work and lack of clarity concerning what is essential for the newly-graduating professional to know and be able to practice" (Ramsden, 1992).

In a study of the requirements of engineering education, Macaulay and Mylopoulos (1995) found that the requirement of engineering courses tended to focus on techniques and models, but industry required that students be taught skills such as interviewing, group work, negotiation, analytical, problem solving and presentation together with the modeling. Therefore, there is a mismatch (Monette, 2007) occurring between the curriculum provided and the market requirement.

In a study on teaching effectiveness and feedback mechanisms in Kenyan universities from the lecturers' perspective (Ngware, et.al., 2005). Aimed to establish whether tools exist for evaluating teaching effectiveness, how effective the information obtained from the evaluation tools and how it was used in order to improve standards and to determine the validity and reliability of the tools used in providing information for improving academic standards. It is found that there was no clear university policy on the evaluation of teaching effectiveness, despite its importance in quality control. Student evaluation of teaching effectiveness (SETE) was found to be unreliable, although widely used where evaluation existed, without other evaluation support systems. Feedback from the evaluation, though crucial in professional improvement, was not made available to the respondents.

Similar to the above study, Martins et.al., (1998) conducted a study on evaluation and continuous improvement of the quality of teaching and learning in higher education in Australia. The approaches underlying schemes for quality assurance of teaching and learning could therefore be characterized thus: an approach based on ensuring that the subject as a whole and not just the teachers are contributing to the improvement of student learning over time. Good teaching is seen in terms of enhancing the relationship between the student and the subject, not just in terms of how individual staff is performing i.e. the focus is on the continuous improvement of student learning. The second approach based on ensuring that teaching stuff fulfill their duties (Davies, et.al.,2006) and identifying those who are not performing adequately, often relying on standardized student evaluation questionnaires to monitor staff performance i.e. the focus is on managing individual staff performance. Findings in the literature about quality assurance, suggest that the discussion is dominated by the struggle to negotiate between the two dangers of overly developmental schemes which may be ineffective in demanding high levels of compliance or promoting actual change and those schemes which are overly managerial and which thereby have a high rate of compliance, but remain ineffective in changing actual practices. The art of designing assessment so that the outcomes match the objectives of the developer of the scheme is not well practised or well taught.

According to the Harvey (2001) model of employability the relationship between employability-development opportunities provided by the higher education institution and the employment of the graduate is further complicated by the role played by employers. In the end, it is the employers who convert the 'employability' of the graduate into employment. Therefore, employers should shoulder the responsibility in students' employability education.

Employers have also reported shortages in generic and interpersonal Skills (Mahbub, 2001). Adelina (2002) added that employers want multi-cross skilled workers, English speaking employees and graduates that are made for industry. According to Mahaleel (2002) an ideal graduate consists of 3 main areas, namely; high performance in hard skills (Math, technologies, economics, human resources, sciences, ICT skills, business, global politics, global general knowledge, geography, teaching strategies), soft skills (creativity, innovation, multi lingual, communication skills, analytical skills and leadership skills) and competitive skills (drive for results, can do attitude, attention to detail, teamwork and consensus). Again communication and enterprise skill was found to be part of the skill set needed by industry. Has the lack of this skill contributed to the cause of the unemployed engineering graduate? Therefore, this study will explore further.

Universities and the relevant authorities involved in engineering graduate development have to emphasize practical and technical skills, and also to take into consideration personal and generic skills. Working in an integrated engineering context emphasizes the development of personal and professional competencies, especially the ability to work and communicate within cross-cultural project groups (Chojnacha et.al, 2000; Anderson, 2004). Further it involves the interrelated work of several disciplines. Projects done in this international environment are real projects provided by industry. This learning and teaching concept emphasizes the development of the hard and soft skills asked for by society, industry, universities and students.

Students in classrooms today are given projects chosen according to industry and academic world. Students are prepared with lectures and tutorial sessions. Group meetings are provided for students, enabling them to develop presentation skills, critical thinking and communication skills. According to Rick (2005) the inference is that the universities that produce these graduates do not teach it as well as they did in the past. Hence, literature and statistics show that there are engineering graduates being unemployed. This gives feedback to the researcher that there are some weaknesses; either the university does not achieve its aims or industry fails to transfer the employability exposure to engineering students.

Though university educators have positive views of the curricula, they are disappointed with the lack of active participation of students in tutorials and their overall academic endeavour. This was evident from the study of preparing graduates of the University Sains Malaysia for employment (Pandian and Aniswal, 2005) where "students rely too much on and want a lot of spoon feeding without working on their own initiative" (pp.96-97). In the same study, students also indicated that they are generally happy with the university's curricula but they admit their over-dependence on materials and references in Bahasa Melayu (Malay language), which clearly points toward their poor command of English. The employers surveyed also feel that the content provided by the university is sufficient and other skills or requirements can be supplemented by the university's curricula. But this study does not clarify the cause of the unemployment of engineering graduates or if the university has provided sufficient knowledge and skills to the industry. A deeper study should be conducted for further investigation.

Zalizan (2000) postulates that to a certain extent the common aims of universities these days are learning and knowledge formation and as such, the learning and teaching are conducted in a very traditional context and approach where knowledge are "viewed as a commodity that can be transferred into an empty vessel waiting to receive it, i.e. the students' mind" (p.2). The fact is such approach is still practiced widely in local universities. For example, Norlena et al. (2001) examined the learning styles of University Kebangsaan Malaysia (UKM)'s students and their academic achievements. From the findings, Norlena acknowledges the need for the inclusion and augmentation of teaching methods that encourage creative and critical thinking.

As stated by the National Higher Education Research Institute (2005), it seems increasingly obvious that the traditional processes of curriculum design being led by the 'theoretical philosopher cum subject-specific content-specialist', as in the past, is inadequate in today's world. There is now an urgent need for universities to develop new curricula, especially pertaining to language and literacy, consultation and co-operation with employers and employee organizations. Employer perceptions and workplace cultures as well as routines need to be analyzed to determine what new reading, writing, computation, speaking and reasoning skills are required to perform job tasks effectively.

In addition, graduates must experience the university curricula that allow them "to easily move with changing technologies and to integrate concepts and ideas from different areas into practical applications" (Mahmoud, 2000). This is a must if Malaysia wants to remain competitive in the global economy. Naturally, the curricula of the local universities must be able to "produce a highly skilled workforce as well as technology and techno science which can lead to the discovery of new products and processes" and therefore, the curricula designed must encourage innovation and be "responsive to the needs of the rapid changing globalized knowledge economy" (Molly, 2004).

The new millennium is set to change the work environment in various dimensions. Jobs that existed in the industrial age are being replaced by new types of job and work requirements that did not exist before. Globally there is a shift from manufacturing to service industries and also a shift within both manufacturing and service sectors toward jobs that require information processing and analytical skills rather than brute force (Castle, 1996). Even in countries where manufacturing industries are growing, the nature of manufacturing is changing rapidly. New forms of manufacturing and service are arising, which depend on careful applications of science and technology, customize production, marketing and distribution; access to real-time networked information and high level of national and international communication among teams (Carnoy et.al, 1993). Keeping in time with these developments means there are adjustments which have to be made to the curricula and learning styles if they are to be relevant to the new demands of working life and the dramatic global economic changes that are taking place. Kalantzis and Cope (1993:pg. 3) state that “in responding to the radical changes in working life that are currently underway, we need to tread a careful path where students have the opportunity to develop skills for access to new forms of work through learning the new language of work. … Students need to develop the skills to speak up, to negotiate and to be able to engage critically with the conditions of their working lives”.

2.3 Employer’s needs.

The criteria to be employed depend on certain skills. The continuous change in organization structures, the development of service economy and the consequent focus on customer service, a continual drive for quality and strong competition, as well as technological developments have contributed to the changing demand and needs amongst employers. Therefore, to face the challenging market, employers require the skills necessary for their employees to operate effectively and flexibly in order to utilize their skills in the workplace.

In this study, the researcher is specifically looking at engineering graduates. Therefore the study focuses at the higher job level, for example from supervisor level to director level. Before researching further into the employer's needs, there are a few issues regarding this that need to be clarified. According to Dench, (1997) and Pool et. al., (2007), there is a lack of a common terminology used by employers, practitioners and researchers. Several (Clanchy & Ballard, 1995; Harvey, 2001; Holmes, 2001) terms are used for example, behavioural, generic, transferable, core and key skills.

Employers of engineers and IT professionals, reported that technical skills can easily be 'trained in' but to find the necessary personal characteristics and educational background was often a problem (Dench, 1997). Some employers want employees who will be reliable and will fit in the existing workforce; others are more demanding. Some have to show their previous work experience during an interview (Dench, 1995). Recent studies of employers' skill needs suggest that these types of personal skills are becoming of crucial importance across occupations and to employers.

According to the data received from research done by Mahbub, (2001) most employers require graduates entering their firm to have social and communication skills, commitment, initiative to work and learn, mental and physical endurance, and the ability to speak and write English. In the research, employers were also asked to suggest other areas they think were important to further enhance the graduates' ability to work. The majority of respondents indicated that computer knowledge and information technology as the most important area to be emphasized on during the course of study. Other areas that need to be stressed, according to the respondents were construction technology, construction contracts, more exposure to the quantity surveying profession and practice procedures (through industrial training), project management, commitment, creativity, self motivation, good communication, presentation and writing skills and negotiation skills. This clearly indicates that graduates have to equip themselves not only with knowledge but also skills in dealing with people (interpersonal skill) and enterprise skills. Therefore, the need to pursue this research would give an advantage to future graduate employees and employers.

Looking at modern engineering education, the required skills base is no longer just technological. It now includes a demand for a person to be proficient with open-ended problem-solving and applications (enterprise skill). However, the ability to collect, analyze and report a large amount of technical, operational and statistical data has become a must. In addition, the engineers of today must be able to speak, read and write good English and to work in interdisciplinary and international project groups to solve increasingly complex problems (Skates, 2003).

In a product context, appropriate technology dependent methods are necessary and these methods cover the areas of traditional engineering that address the suitable use of materials for a product's design and to serve functional needs. The traditional engineering is being complemented with further methods (often team-based) in order to assist with the efficiency and effectiveness of the design core, such as Quality Function Deployment (QFD), Design For Assembly (DFA), Design Failure Mode and Effect Analysis (DFMEA), Design for Environment (DfE), etc. These methods are directed towards the actual process of assessing and serving needs through product design; this includes market needs and manufacturing needs. These can contribute in many ways to the improvement of productivity, increased quality and reduced reworking costs, improved production efficiency and shortened production cycles.

In the modern manufacturing organization, it is axiomatic that serving manufacturing needs will also serve market needs due to the required responsiveness to customers. One danger of the traditional engineering approach, which is centered on product design for function only, is that the business organization encourages designers to indulge themselves in engineering design and less in communication and assessing the overall needs to be served (Abdul-Shukor, 2003).

It is important to note that, on a wider scale, the survival of manufacturing industries depends largely on faster delivery of a better product of high quality and low cost to customers. In the case of Malaysia, industries and organizations are looking for well-trained graduates to meet the above challenges. With respect to product design and manufacture, the abilities to visualize and predict the outcomes of a decision made in developing new products at the early design stage are vital for engineers in order for any product development process to function effectively.

Engineering education has come under heavy criticism because of a lack of attention in introducing new skills requirements and the need to better prepare engineering graduates for job demands. A study was conducted on how engineers spent their job assignments (Maul, 1994). It was found that a considerable amount of knowledge that the engineers felt was required to perform their job but was not part of their undergraduate education. Troxler (1997) proposed that part of the solution to the above challenge involves the discovery and identification of integrated activity sets and teaching methods, which simultaneously supply students with the basic tools, critical thinking abilities, and synthesizing experiences with all aspects modern manufacturing processes, in a way that allows them to be more productive and creative in industry over a shorter period of time. Engineering students need to learn manufacturing engineering by integrating design, manufacturing processes, customers' needs and wishes, cost sensitivity and failure predictions analysis.

2.3.1 The skills needed

Personal attributes include intellect, knowledge (in some cases) a willingness and ability to learn and continue learning, an ability to find things out, a willingness to take risks and show initiative, flexibility and adaptability to respond, to pre-empt and ultimately develop self-skills such as self-motivation, self-confidence, self-management, and self-promotion. These personal attributes are important to allow graduates to fit into work culture, do the job, develop ideas take initiative and responsibility and ultimately help organizations deal with change (Harvey, Moon and Geall, 1997).

The set of specified skills that has not changed greatly for a quarter of a century: include communication skills, numercy, self-confidence and self-discipline, problem solving, analysis and interpersonal skills. This was featured alongside knowledge and intelligence in organizational graduate specifications in the 1970's (Kelsall, Poole and Kuhn, 1972). Technological and organizational changes over 25 years have included ICT skills, team working, flexibility, adaptability. Furthermore, 'problem solving' has become 'creative problem solving' and 'risk taking' has become a key attribute. However there is much less emphasis on knowledge and far more on willingness to continue teaching (Harvey, 1999).

The Pedagogy for Employability Group (2004) provides a list derived from research carried out over the last 25 years and suggests that employers expect to find that the following generic skills have been developed in graduates:

- Imagination/creativity;
- Adaptability/flexibility;
- Willingness to learn;
- Independent working/autonomy;
- Working in a team;
- Ability to manage others;
- Ability to work under pressure;

- Good oral communication;
- Communication in writing for varied purpose/audiences;
- Numeracy;
- Attention to detail;
- Time management;
- Assumption to responsibility and for making decisions;
- Planning, coordinating and organizing ability; and
- Ability to use new technologies (not included in the list above but mentioned in many others and an important element).

There is also the need to mention enterprise skills which are often discussed in the employability literature. It is likely an enterprise graduate would be valued in any organization, either profit-making, non-profit making, large or small (Pool, et.al., 2007). It is suggested that an enterprise graduate would be imaginative, creative, and adaptable and a willing learner with all the skills listed under the generic category.

2.3.2 Industrial Training/Placement.

Industrial training or industrial placement or industrial internships or work-based learning involve sharing of a student between the university/college and an industrial partner or employer. There is duration of time agreed by the involved parties. The minimum length of training can be from 3 days or 3 to 6 months. The industrial training time frame is between semesters. These approaches blend formal education and practical experience and education at the industrial location. More than one single advisor can be involved and direction can be provided by both the academic and industrial participant. Advantages to all parties involved are work exposure for the graduate student, to the university/college network of future applied research and consultancy and for the employer is their future work force.

> ‘The University of Leeds defines placement as any planned period of learning of a duration of more than three days, normally taking place outside the University, which contributes to the learning outcomes of a taught programme of study leading to a University award. It therefore includes: industrial placements; clinical placements; other work placements (including in schools, prisons etc); study abroad; and study at another educational institution in the UK’. (Source: QAA Code of Practice and other guidance, Learning and teaching Board, The University of Leeds)

Mpandey (1998) contributed to the need for improved practical training of graduates and continuous improvement by noting that in engineering laboratories and workshops:

- Some equipment became obsolete, some suffers from wear and tear;
- There is often an absence of a maintenance culture;
- Workshops and laboratories are not adequately stocked with up-to-date equipment and consumables.

According to Walakira (2000) knowledge acquired and skills developed through education and training foster productivity of a given population, with the need for universities to regularly conduct evaluation of training to achieve greater returns on investment.

Warr et.al., (1999) predicted three levels of training outcome through their study that examined an association between three levels in Kirkpatrick's framework (reactions, learning and job behaviour) and they investigated both individual and organizational characteristics. This suggests the kind of evaluation of training that should be used at universities in order to establish the graduates' abilities in meeting future employment challenges.

This is agreed by Kagaari, et al., (2007), their reasons are they believed that industrial training is important to give some exposure to students pertaining to the actual working scenario so that they will gain more experience and knowledge about the profession. Other than that, respondents also stated that through industrial training, students can familiarize themselves with actual working conditions.

Krull, I.S., et al., (2001) supported this, students in industrial training gain valuable work contacts, earn money and hopefully mature more quickly in their selected careers.

Brennan and Little (1996) summarize the ways in which work-based learning in currently incorporated into programmes leading to academic awards as:

- Brief encounter (up to seven days aimed at awareness raising);
- Short project (several weeks immersion under sheltered conditions-e.g. creative design occupations);
- Sandwich placement (typically 6 to 15 months introduction to professional responsibility- e.g. engineering, built environment professions);
- Alternating sequence of placements (between 2 and 10 novice professional placements-e.g. teaching, nursing, social work);
- Employment based learning programme (all or most is in work environment);
- Immediately post-qualifying (1 to 2 years pre-registration experience- e.g. medical house officer, articled solicitor);
- Continuing professional development (a series of episodes, either formal or informal) (adapted from table in Brennan and Little, 1996, p.10)

Brennan and Little (1996) recognize that designing a curriculum or framework for this kind of work-based learning is not an easy task. There is likely to be a tension between the needs of the learner, the professional or regulatory body, the employer and the HEI. They suggest the curriculum may have one or more of the following focuses:

- Discipline-based (supporting HE-based theoretical teaching);
- Vocational skills acquisition;
- Personal skills development.

The key issue in relation to industrial training is how to identify what is to be learned and how to ensure that this happens. Edmunds et.al., (1997) describe the use of a competence framework which might support sandwich placements and to both assess and accredit what has been learned. The use of "learning contracts" to which the learner, the employer, and in some cases HE institutions are all parties is advocated by a number of authors (e.g. Boak, 1991; Thompson and Stephenson, 1991; Stephenson and Laycock, 1993). This literature has failed to identify the 'what' and 'how' issues of industrial training learning. This literature also has not rectified clearly the content of skills and knowledge transfer from industrial training. Perhaps this is because as described by Cheetam, et.al., (2001) there is no single theory of learning in the workplace, rather than considerable evidence that a great deal of learning takes place at work (Marsick, 1987; Marsick and Watkins, 1990; Eraut et.al., 1997).

Alternatively, Joos, et.al., (2004) had proposed a solution for innovative industry-university partnership in power engineering at Montreal, Canada. Many research papers acknowledge the university contribution in this situation but few comment on the contribution of the industry in this partnership. Joos et.al., has a proposed solution by introducing an institution which is funded by local utility and by other industrial partners. The contribution and involvement of a university are that university students must be registered as members with the institution, and there be a commitment to make the institute programme available to their students and promote its offerings and universities will provide the teaching staff for one or two courses in which they have the expertise. The industry contributes in participating in the definition of an academic programme through the academic committee. It will also provide expertise in the establishment of the detailed content of the courses, in particular, by providing relevant examples, applications, and industrial data. It will also actively participate in the definition of the laboratory content and where possible provide industrial equipment to illustrate industry procedures and operations. Industrial partners are involved in the teaching of some specialized courses, such as electrical power equipment, power system protection, and material for power engineering. Industrial partners also provide scholarships to students. The industry partners choose the scholarship candidates based on its hiring needs and requirements and with the aim of considering them for a position after graduation, if there are appropriate openings. Internship and final year engineering and design projects will also be provided by industry.

This section has shown the weak involvement of industry in the technical electives, a dilemma to form flexible curriculum developed in conjunction with industry, alongside the faculty, the enhancing of the traditional university course content with practical aspects and experience provided by industry. Further, the researcher explored the engineering education in Malaysia and the comparison of engineering education in developing countries such as South Africa and India.

2.4 Role of Higher Education Institutions (HEI)

2.4.1 Engineering education in Malaysia.

There are three main channels towards engineering degree programmes in Malaysia, namely, the Matriculation, STPM (an equivalent to the United Kingdom Advance Level examination) and Diploma. Both the Matriculation and STPM programmes are completed in one and a half years, whereas Diploma programme take three years.

These three main channels continue supplying the bulk of the students to do engineering at the universities. Changes in the input elements are impossible as they are governed by the rules of the Ministry of Education.

Completeness in the training of engineers, which among others include communication, management and innovative thinking skills, are necessary in preparing engineers who are capable of performing useful functions in industry, immediately upon graduation (Johari, 1999; Goonatilake, 1982). O'Kane (1999) in highlighting the future challenges in engineering education has included globalization, rapidly expanding knowledge and the changing emphasis in scientific fields as the important aspects to be considered when preparing a suitable engineering programme.

The following skills and competencies are considered necessary in preparing engineering students for their professional training upon graduation and the ensuing years as they develop into professional engineers and managers.

- Global and strategic skills enable students to adapt easily within the borderless world and rapid expanding knowledge and economy.
- Industrial skills are those required beyond the scientific and professional competencies, but are necessary in the advanced phase of the graduate's career such as management, law, environment, communication, economics and finance.
- Humanistic skills provide a balanced engineer with high ethical and moral standards.
- Practical skills enable students to be directly involved with hands-on activities or real-life situations, thus providing the basis for integrating the intra and inter-engineering and non-engineering knowledge.
- Professional competency covers the technical competency required to perform specific engineering tasks.
- Scientific competency enables students to have a firm foundation in engineering science, thus enabling them to realign themselves with the changing emphasis in the scientific field and to develop an interest in R & D and innovation.

The changing world to a borderless environment, with the World Trade Organization (WTO) becoming more influential, calls for graduates that are well prepared to compete globally. It would also allow graduates to be easily assimilated within the domain of international standards. Since information technology or IT is influencing a greater part of society, this subject is indeed worthy of consideration. The ability to forecast and map technologies and develop strategies would ensure the graduates to be at par or better than any established institution trained graduates. The borderless world would also demand that the graduates be exposed to international culture and businesses, and international languages (such as English).

The strong emphasis on practical subjects indicates the importance placed upon hands-on skills. The practical subjects must be structured and preferably industry related, thus giving strong university-industry relationship. The design component is also meant to provide teamwork experience and solving real life problems. The issue of industrial skills was also highlighted in the National Workshop on the Roles of Industries in Engineering Education among academics and industrialists (UKM, 1999), emphasized the needs of engineering graduates to have industrial skills.

The requirement for degree programme minimum entry qualifications of STPM or equivalent is 120credit hours; 80 credit hours (minimum) for engineering subjects and the balance 40 credit hours is for related subjects (such as languages, general studies, co-curriculum, management, law, accountancy, economics, social sciences etc.)

The scientific and the professional contents must never be compromised, as these are the core components of any engineering fields. Any slackness in the curriculum could even lead to serious errors by engineers in discharging their duties and the Malaysian engineering model provides flexibility in designing the core curriculum.

The humanistic skills are essential in producing a balanced engineer. Although ten credits are allocated to this component, the Ministry of Education has already made seven compulsory, which are Islamic Civilization, Asian Civilization and Nationhood. The remaining credits should develop further the humanistic aspects of the students and motivate them to be ethically and morally responsible persons who would contribute effectively to building the nation.

Fleddermann's (2004) goal is to foster "moral autonomy", the ability to think critically and independently about moral issues and to apply moral thinking to situations that arise in the practice of engineering. This goal is to be accomplished not by teaching the right thing to do but rather to train engineers in how to analyze complex issues and learn how to resolve them in the most ethical manner.

Maxwell, J., (2003) and Veach at.al., (2006) argue that there is no such thing as engineering ethics, or business ethics but only ethics. People try to use one set of ethics for their professional life, another for their spiritual life and yet another at home with their families. If an individual desires to be ethical then they should live by one standard that can apply to their professional, spiritual and personal lives, regardless of their profession.

The researcher will compare employability and engineering education in some developing countries such as South Africa and India in the next section. The researcher would like to explore engineering education practices. Also do the engineering graduates in South Africa and India meet the workplace needs?

2.4.2 Comparison amongst developing countries

2.4.2.1 Employability and engineering education in South Africa

In South Africa, development strategies, which stress issues such as egalitarianism, rural development, and the eradication of ignorance, poverty and diseases, are most applicable. Such purposes give rise to a distinctive view of the nature of quality and appropriate ways of embedding quality in teaching, learning, assessment and the curriculum (RSA Doe, 1995).

The South Africa Qualification Authorities (SAQA) is responsible for four strategies. Firstly, to develop the rules of the National Qualifications Framework (NQF) and overseeing the implementation thereof. Secondly, to formulate and publish policies and criteria for the registration of bodies responsible for establishing education and training standards or qualifications. Thirdly, to define criteria indicating different levels of achievement. Fourthly, to determine the format in which qualifications or unit standards have to be submitted for registration (RSA, 1995). These correspond with some uncertainty, with the aims of higher education institutions. Universities and the traditionally more vocational and technical courses are trying to do the same things by offering the same type of programme. South Africa, in preparing its labour, has tried to align with the demand of the workplace needs. Unfortunately, there is a danger that the focus of higher education is to impart the skills required in the workplace, rather than the production and dissemination of knowledge (Kruss, 2004:674). As elsewhere, an often polemical debate has emerged in South Africa, with diverse interpretation of whether higher institution should become more responsive, on what should it become more responsive and how it should become more responsive (Kruss, 2004: 674).

Based largely on the recommendations of the National Commission on Higher Education (NCHE, 1996), the White Paper on Education and Training 3 (WPET) (Department of Education, 1997: pp. 1.12) set the parameters for developing national higher education policy by defining a three-fold role for institutions:

- *Human Resource Development*: the mobilization of human talent and potential through lifelong learning to contribute to the social, economic, cultural and intellectual life of a rapidly changing society;

- *High-level skills training*: the training and provision of person power to strengthen this country's enterprises, services and infrastructure. This requires the development of professionals and knowledgeable workers with globally equivalent skills, but who are socially responsible and conscious of their role in contributing to the national development effort and social transformation; and

- *Production, acquisition and application of new knowledge*: national growth and competitiveness is dependent on technological improvement and innovation,

> driven by well organized, vibrant research and development systems which integrate the research and training capacity of higher education with needs of industry and of social reconstruction.

The White Paper on Education and Training (WPET), (Department of Education, 1997) thus reflects the new global consensus, but emphasizes a national commitment to balancing dual policy goals of equity and economic development (Kruss, 2004: 675).

The National Qualifications Framework (NQF) emphasized skills over formal knowledge, taking a holistic view of personal, social and economic needs in South African society (NCHE, 1996). The NQF endorses an outcomes-based approach towards education and training. This move is due to the growing concern about the effectiveness of traditional methods of teaching and training, which were content-based. This is to promote overall improvement in the level of skills of the workforce as a means to improve and promote the prospects of employees, the productivity in the workplace, self-employment and the provision of social services. A quote summarizes this policy section, 'once you get out of that institution, we are expecting you to hit the ground running' (Focus Group Interview, 13 March 2002). There is a strong convergence with the emerging model underpinning the public sector's expectation that the majority of graduates should be prepared with the general and specialized high-level skills required to be employable directly upon leaving the institution (Kruss, 2004:682). This emphasizes that higher education is orientated towards to the needs of industry and society, and not only to the present but to the future creation of knowledge.

According to Teichler (1999,p. 285), it is not clear what type of students the world of work really expects higher education to produce. There is acknowledgement of the demand for generic competencies, social skills, personality development, problem-solving skills, information-technology skills, and life-long learning skills. However, it is not always clear what these terms signify, nor what their relative importance is, nor how they can be effectively encouraged, nor how they stand in comparison to specialist knowledge of high-demand subjects, such as microbiology, web design and electrical engineering. According to Harvey et. al., (1997) studies do not address these underlying issues.

In 1994, 70% of tertiary students were enrolled at university; this now has dropped to 60%. Some universities experienced drops of up to 27% in enrolment between 1997 and 1998. Causes include fewer matriculation exemption passes, a higher unemployment rate and limited access to funding (Maharasoa & Hay, 2001:141).

In particular, higher education institutions were criticized because they do not offer adequate 'soft skills'-problem solving, communication, entrepreneurship, good citizenship, managerial skills, leadership skills-'generic skills that you need to learn across any walk of life' (Focus Group Interview, 13 March 2002). Here again is the expectation that, what was formerly the preserve of work-place, tacit knowledge, skills and attitudes that were developed through work experience should become drawn into the essential functions of higher education.

2.4.2.2. Employability and engineering education in India

A study reported that India is ‘flooded’ with engineers due to large number of engineering colleges set up all over India in between 1997-2007 (Venkataraman, 2007). In Tamil Nadu alone, there are more than 220 engineering colleges with intake capacity of around 72,000 students. From the intake, there are around 50,000 engineers who graduate each year. This study also reported around 20,000 engineers do not get suitable jobs each year and many of them take up non engineering jobs which have no relation to the engineering studies that they have undertaken or remain unemployed for several years. While employers who are involved in consultancy, design and detailed engineering work, research and development activities, corporate planning, teaching etc., complain that they are having difficulties to get suitably qualified and competent engineers. This was due to most engineers with good academic performance going abroad for jobs and higher education studies. Other problem related to engineers in India is frequent job hoppers who often change jobs without any rhythm or logic except for a few hundred rupees of more salary.

According to a McKinsey Global Institute study (2005) there is uneven quality in academic faculty and curriculum and weak spoken-English skills (particularly among graduates of non-elite institutions), only one in four Indian university graduates could be considered "suitable" for employment by multinational companies or their Indian outsourcing partners. In another recent study, commissioned by India's National Association of Software and Service Companies (Nasscom) there were similar findings, concluding that 75% of Indian engineering graduates are deficient in terms of technical or presentation skills, English-language fluency, and teamwork ability. By this sobering estimate, if outsourcing demand continues to grow at its projected rate, by 2010 India will face a shortfall of 500,000 skilled workers (Business Asia, 2006).

The emerging colleges and universities may be addressing the quantity problem while exacerbating the quality problem. Academic standards at these second and third-tier institutions are less rigorously applied and admission policies are often based on parents' financial standing rather than students' academic ability. An educational system founded on rote learning does not nurture the intellectual creativity or analytical skills that are essential to the information technology industry (Business India Intelligence, 2006).

A report of an innovative partnership industry-university programme was produced in India. This pilot programme was to create design engineers with combination of electronic-design skills and an adequate knowledge of the latest tools. Universities often lack the resources for developing labs or to invest in software tools. The lack of a coordinating body is also a problem. Therefore, the India Semiconductor Association and VLSI Society of India have launched a pilot programme with Belgaum-

Vishvesvaraya Technological University for greater industry-academia interaction, to create an industry-oriented curriculum, and facilitate the infrastructure to support the industry needs (Giridhar, 2005). This initiative encompasses research, curriculum and faculty development, EDA-tool support and ecosystem creation. This project was similar to a study done by Joos, et.al., (2004) partnership in power engineering at Montreal, Canada as indicated in section 2.3.2.

Bhattacharya (2008) has added the role of ICT in engineering education in India. Her study suggested this alternative from the 'chalk and talk' method or 'lecture mode' in direct face-to-face classroom teaching where there is high demand for higher education, including engineering education is popular. In providing high quality education for all potential engineering graduates there are issues that need to be addressed. The quality of resource material produced could be affected by work overload due to faculty activities (research, teaching, consultancy, etc.). Financial support for materials disseminations should be revised and self-sustaining and effective and not dependent on government or external agency for financial support. This study does not comment on the industrial training programme as part of the educational requirement or any method of transferring hands-on experience to students. From the researcher's own experience, to have virtual experiences is totally different to having personal experience and to enhance the skills that industry needs.

Similar to other countries, India cannot avoid its gender issue in engineering. Gupta, (2007) described India's cultural context discriminates amongst women in science and engineering. The study has found that women studying science and engineering come from families with higher income; fathers working in government or private administrative, managerial and professional jobs. Women in India as part of the patrifocal (focus or centered on father) system have to fight for their rights, fight for what is legally granted to them, fight traditional stereotypes and find respect and identity. For instance, the mother-in-law and sisters-in-law form crucial components of the brigade that may discriminate and harass a married woman. This study finally tried to suggest the idea to fight gender oppression within their own cultural models of society rather than through those suggested by the Western standards. It might not suitable because of cultural and norm of life differences.

2.4.3 Global status of engineering graduate requirement

According to Johari et.al., (2000) and Sapuan et. al., (1999), generally, the number of years of pre-university study ranges from 11 to 13 years. The total number of credits for a student to graduate ranges from 108 to 186 for non-European countries. For Germany (Ismail, 1999), France (Ismail, 1999), and Denmark (Ismail, 1999), the credit load ranges from 210 to 243 credits. It should be noted that the credit comparison is not entirely appropriate as the definition differs greatly, even within a country.

The duration of study for all the universities is either four or five years with the exception of Hong Kong (Johari, 1999) and the United Kingdom (Sapuan, 1999), which still maintain the three-year programmes. However, most of the universities in the United Kingdom are also offering a 4 year MEng programme such as an enhanced bachelor degree, giving greater emphasis to industry related projects (Johari, et.al, 2000).

In more recent times a higher education area has been established across greater Europe through the Bologna Process (1999) and subsequently the Lisbon Protocol (2007) to reformat into Bachelors, Masters and Doctoral study of all courses.

Most of the universities studied have included the final year project, design project and practical training in their engineering programme. Many of the universities give credits to basic sciences and social/humanities courses as part of the overall credits. For example, the percentage of credits for basic and social sciences course is approximately 40% at the University of Nagoya (Osman, 1999) while that at the Indian Institute of Technology it is only 15% (Jaafar, 1999).

According to MCED/IEM, (2000) study group on Malaysian Engineering Education Model has classified the global engineering education models into four distinct groups, namely, the British, American, European and Hybrid models. A summary of classification is given below.

2.4.3.1 British Model

Both specialized and more general engineering programmes are available. These could be a 3 year programme followed by industrial experience leading to Incorporated Engineering Degree and a 4 year or 3 year programme with matching sections and followed by industrial experience leading to a Chartered Engineering Degree. Industrial training is desirable but not compulsory. This aspect is taken care of by design and/or industrial projects in most universities. The final year projects, which are usually individually done, are a requirement for both degrees. The transferable skills are embedded within the curriculum (Johari, 2000) in which the Engineering Council recommends at 60% of the total curriculum. Professional status is subject to professional institutions' requirements.

2.4.3.2 American Model

The duration of study for an engineering degree in the United States is 4 years. Industrial training is not compulsory at most universities whereas a final year project is compulsory at some universities. Social sciences and humanities courses are generally offered at all universities. Professional status is awarded by the respective states.

2.4.3.3 European Model

In Germany there are three types of tertiary institutions, namely:

- University and Technical University

- Berufsakademie (recently known as University of Cooperative Education)
- Fachhochschule (University of Applied Sciences)

The qualification, Diploma Ingenieur (Dipl-Ing) is awarded by all institutions, with an additional tag BA and FH for those from Berufsakademie and Fachhochschule respectively. The Diploma-Ingenieur is considered as an equivalent to a Master's degree while the awards from Fachhochschule and Berufsakademie are considered as Bachelor's degrees. The average duration of study at universities is 4.5 years while at Fachhochschule and Berufsakademie are 4 years and 3 years respectively. This has changed recently due to the education is treated as part of the country economy. Most of the European countries have similar to the British education system which is much shorter period for a Bachelor degree.

According Johari, et.al., (2000) in France, the duration of study at universities is 5 years (again this is much changed), whereas, those going for the Grande Ecoles to study engineering, need to attend the class preparatory for 2 years and followed by 3 years at Grand Ecoles. Rigorous implementation of project-based learning and industrial attachment has enabled the recipients of Diplome d'Ingenieur degrees to practice as professional engineers immediately. There is a strong linkage between the institutions, laboratories and industries in the European model. The French system is much more abstract and scientific. More didactic and has fewer spaces for professional skills.

2.4.3.4 Hybrid model

Hybrid comprises models that are a combination of the previous models. The duration of study at most of the universities generally offer humanity courses as well as the technical courses. Some universities do not include language courses in the curriculum. There are universities that give credits to co-curriculum. As a whole, the engineering core subjects are between 52 and 63 % of the curriculum. Final year project is given credits but industrial training, though compulsory, is not credited.

The Federation of Engineering Institutions of South East Asia and the Pacific (FEISEAP) has proposed an accreditation model that could be adopted by its member countries in order to mutually recognize engineering programmes. Similar accreditation criteria are also required by the Accreditation Board for Engineering and Technology (ABET) which is monitoring the engineering programs in the United States. ABET defines an engineering program as a program that must be able to demonstrate that the graduates shall have the following attributes (Anon, 1996):

- An ability to design system, component or process and meet desired needs;
- An ability to function in multidisciplinary teams;
- An ability to identify, formulate and solve engineering problems;
- An understanding of professional and ethical responsibility;
- An ability to communicate effectively;

- The broad education necessary to understand the impact of engineering solutions in a global/social context;
- A knowledge of contemporary issues;
- An ability to use techniques, skills and modern engineering tools necessary for engineering practice.

From ABET's definition and requirements, any new engineering programme should be able to produce graduates that are technically competent and having sufficient industrial skills. It means that the graduate should possess the knowledge of core engineering subjects, supportive subjects and non-engineering subjects.

Currently, there is also a move towards mutual recognition through a mutually accepted accreditation process. This has been propagated by the Washington Accord, and contemplated by FEISEAP (1996), which allows free movement of engineers within the member countries.

Table 2.1 shows the comparison between the various countries' engineering education models, as to the engineering content and the years of study as well as the degree awarded.

Table 2.1: Comparison of engineering education models

Country	Britain	United States	Australia	France	Germany	Malaysia
Schooling years	13	12	13	12	12	13
Entry requirement	A levels	SAT	HSC	Bac	Abitur	STPM
Year 1				Class Prep		
Year 2				Class Prep		
Year 3	BEng & BSc				Dip-Ing(BA)	Dip-Eng
Year 4	MEng	BS	BEng		Dip-Ing(FH)	BEng & Bsc
Year 5	Msc		Msc	Dip-Ing	Dip-Ing	Msc
Year 6		MS			MS	
% Core courses	>90%	58%	75%	70%	84%	96%
%other courses	<10%	42%	25%	30%	16%	4%

Source: Based on Johari, et.al., (2000) with the author additions regarding Malaysia.

2.5 Generic skills and policy

2.5.1 Generic skills definition.

Most employers define a set of 'generic' (Sally Dench, 1997), usually personal skills which they seek when recruiting new employees. These personal attributes or generic skills include communication skills, the ability to apply basic literacy and numeracy in a work situation, being a 'team player', the ability to relate to customers and clients, taking the initiative (for one's own work and personal and career development), taking responsibility and making decisions.

Most countries have difficulty defining generic skills because of each sectors professionals associations, higher education institutions, employers and training authorities have given different terms such as the ‘soft’, ‘transverse’ or ‘transferable’, personal development skills, key skills and core skills, (Kruss, 2004; Dench, 1997; Teichler,1999). There has been considerable debate in the literature about the terminology for generic skills (Pool, et al., 2007).

2.5.2 Malaysian generic skills policy.

The researcher mentioned in section 2.4.1, the Malaysian engineering education curriculum has included the generic skills and competencies considered necessary in preparing engineering students for their professional training upon graduation and the ensuing years as they develop into professional engineers and managers.

Industrial skills are those required beyond the scientific and professional competencies, but are necessary in the advanced phase of the graduate’s career such as management, law, environment, communication, economics, finance. Most engineers would eventually leave the routine engineering design or supervisory job to become managers and directors of companies. Thus, courses like management, finance, economics, and engineers in society, communication, law, occupational safety, human resource management and innovation will prepare students for this eventuality and have become necessary, where the industrial skills are nurtured from the undergraduate level. These skills would also ensure that engineers would not be ‘back room boys’ (Johari, et.

al., 2002) but rather dynamic and well-respected persons that are capable leaders. The transitions to becoming managers and directors can be enhanced. The management, economics, human resource management and finance courses, among others, would provide the basics to sound management and financial control, whereas subjects such as engineering and society and occupational safety would provide the basis for good practice.

The Institution of Engineers Malaysia, Malaysian Accreditation Board (LAN) and Institution of Higher Education Learning play the role of monitoring the implementation of the agreed stated engineering curriculum. Therefore, any slackness in the curriculum could lead to serious errors by engineers in discharging their duties and thus, damaging professional integrity.

2.6 Interpersonal skills

2.6.1 Definitions of interpersonal skills

According to McCounnell, (2004) interpersonal skills are those essential skills involved in dealing with and relating to other people largely on a one-on-one basis. The interpersonal communication behaviour of many people suggests they assume to have the ability to communicate effectively, which they do not possess and which they take for granted. One must work conscientiously to develop interpersonal competence by doing the right things at the right times and doing them repeatedly until they become ingrained. As with any human skills, interpersonal skills can be improved through conscious effort. Successful interpersonal communication involves shaping the behaviour of others, often while countering their shaping behaviour. To have a chance of being successful, every interpersonal contact must have an objective and every effort must be made to avoid creating win-lose transactions whenever possible.

According to Marginson (1993) business and industry ranked 'communication skills', 'capacity to learn new skills and procedures' and 'capacity for cooperation and team work' as the three most desired characteristics of Australian University graduates. McCounnell (2004) also indicated that common interpersonal situations include numerous contacts with direct-reporting employees, such as directing, coaching, counseling, praising, disciplining or reprimanding, training, problem-solving and many others. For the department manager, common interpersonal situations also include one-on-one contacts with peers, higher management and other employees external to the organization.

In any conversation, there must be an objective to optimize the conversation. Having an interaction gives us a specific target for which to aim. Formulate the objectives, taking into account what you know about the individuals with whom you are dealing. Every individual is unique in some respects and the better you know those you are interacting with – whether employees, peers, superiors or others - the better you can focus your objectives.

Individuals must know specifically what they need to accomplish with any specific interaction. In other words, avoid overall objectives that are too large for accomplishment within the context of a single interaction. Although you cannot know in advance whether you will succeed in reaching a particular objective, you should have decided in advance what sort of results would constitute success or failure.

The assumption about interpersonal communication is that there is a connection between the behaviour of one party and that of the other; what one says or does will influence what the other says or does. In a particular interaction, it is possible to arrange one's outward behaviour to influence or shape the behaviour of the other party; this may be done unconsciously or it may be done deliberately. Only the other party's overt or visible behaviour is directly accessible; it is not possible to know precisely what another is thinking or feeling.

In an interaction there is also a no win-lose scenario, i.e. no struggle for dominance in an interchange, if both parties to an interaction have equivalent objectives. Interpersonal skills are far more effective when applied in one-on-one interactions than when applied in one-on-several or one-on-many situations, where the opportunities for effective behaviour shaping are far less available. The factors reducing interpersonal effectiveness most commonly are conflicting objectives, shortage of time, emotional arousal and inadequate listening.

2.6.2 Why are interpersonal skills important to an engineering graduate?

Shannon (1980) indicated that some 80% of engineers would find themselves in managerial roles at some point, requiring them to guide highly trained and creative people in a dynamic environment and navigate multilevel interpersonal relationships with peers, managers and employees.

People have a deep-seated need to communicate and the better able they are to do so; the more satisfying and rewarding it will be. Research by Segrin and Flora (2000) has shown how 'good communication or social skills pay many dividends in people's lives'. Those with higher levels of skills have been found to cope more readily with stress, to adapt and adjust better to major life transitions and to be less likely to suffer from depression, loneliness or anxiety. They also have higher levels of satisfaction in relation to their close personal relationships (Miczo et. al., 2001). In a review of research, Segrin (2000) concluded that interactive skills have a 'prophylactic effect' in that socially competent people are resilient to the ill effects of life crises, whereas individuals with poor skills experience a worsening of psycho-social problems when faced with stressors in life. In reviewing the development and contribution of the skills approach to interpersonal communication, Argyle (1999) concluded: 'skills training is now given for many occupations…I wish it were more widely available for the general public – we now know that being socially skilled is a source of happiness'. Continuing this theme, Hybels and Weaver (1998) succinctly summarized the position: 'To live, then, is to communicate. To communicate effectively is to enjoy life more fully.'

In a business sphere there are considerable advantages to be gained from good communication (Hargie and Tourish, 2000) and effective managers have been shown to have a strong repertoire of interpersonal skills (Clampitt, 2001). Baron and Markman (2000) used the term social capital to refer to the benefits that accrue from having a large network of contacts, being an effective interactor and developing a good social reputation. They compared the relationship between social capital and interpersonal skills to that between resource stock and resource flows in organizations, and argued that 'social capital can be viewed as an accumulated asset, while skills in interacting with others are one factor that influences the level of this asset' (p.107). They also showed how those entrepreneurs who possess high levels of interpersonal skill have advantages in a range of areas, such as obtaining funding, attracting quality employees, maintaining good relationships with co-founders of the business and producing better results from customers and suppliers.

There have been many studies that have looked at the need for information systems and computer science graduates to develop their interpersonal and communication skills in order to meet the needs of industry. Van Slyke, Kittner and Cheney (1998), Doke and Williams (1999) and Bailey and Stefaniak (2000) are some of the authors who have written about this need in recent years. It has been shown that poor communication between users and developers is a major factor in the failure of many information systems. Therefore, due to this importance, engineers should develop themselves with interpersonal skills for secure career development, socialization and networking in the future.

2.7 Enterprise skills

2.7.1 Definition of enterprise skills

An enterprise or entrepreneur skill related to the ability to be innovative, creative and solve problems. Williams (1999) draws a distinction between creativity as 'findings, thinking up and making new things' (knowledge for its own sake) and innovation as 'doing and using new things' (creation of new wealth) and entrepreneurs are 'catalysts for change by converting opportunities into marketable realities'(Mauzy et. al., 2003). IPENZ, (2002) state that 'innovation is the act of creating something new and worthwhile, entrepreneurship is the act of carrying an innovation to market in a commercial manner'. It is often about taking an idea that is obvious in one context and applying it in a not so obvious way in a different context.

The definition of innovation used in 3M is 'new ideas plus action or implementation which results in an improvement, gain or profit' (Gundling, 2000). Supported by Steiner (1998), innovators should be 'energetic, enthusiastic, competitive, innovative, thrive on change, diversity and challenge and be able to live with uncertainty'. They must be competent, credible and effective in their area of professional expertise, but be able to blend these technical skills with business acumen. Therefore, they require excellent people skills, including communication skills and managerial skills. In addition to these skills, they also require other sets of attitudes; including a challenge-seeking attitude, being a genuine team player while also being self directed and autonomous, responding positively to external pressures not retreating from them, a desire to keep learning (and not imagining they know it all), be interested in commercial aspects, show ‘intellectual flexibility’ and to be able to keep striving but to also accept defeat.

The characteristic of the innovator and the entrepreneur overlap. Williams (1999) describes entrepreneurs as people who have both the will (e.g. desire or motivation) and skill (e.g. the ability) to project an idea or scheme into the future by backing their judgment with innovative action and persistence in order to turn that idea into reality. They tend to be creative individuals with a never-ending supply of ideas and schemes; action people who make things happen; catalysts (initiators of change); aggressively ambitious and highly competitive; moderate risk-takers (not risk averse but not gamblers); self-reliant and independent; resourceful and shrewd; highly tolerant of ambiguity and uncertainty; determined, optimistic and persistent; and very future-oriented. William (1999) definition asserting that ‘entrepreneurship is what entrepreneurs do rather than a list of personality traits’, therefore, it is clear that innovation and entrepreneurship are contextual, enacted and holistic activities. Any attempts to extract their element parts for inclusion in a curriculum are likely to fail.

According to Sirolli (1999), for enterprise success, there are three critical entrepreneurship skills and passions that are required within or supporting the enterprise management system: the skill, passion and discipline to design and produce a product or service; the skill, passion and discipline to market and sell the product or service; and the skill, passion and discipline to achieve financial management of the enterprise.

2.7.2 Why are enterprise skills important to an engineering graduate?

Previous surveys (Mark, et.al., 2003, David, 2003) have shown that there are several personal and professional attributes consistently identified as critical to the success of an engineer but generally lacking in new engineering graduates. These include; strong skills in communication and persuasion, an ability to lead and work effectively as a member of a team, a sound understanding of the technical forces that affect engineering decisions, awareness of global markers and competition, and demonstrate management skills and a strong business sense.

Engineers must have skills, passion and discipline in one or more of the three basic entrepreneurial enterprise functions: the product, its marketing and sales; and financial management (Gebhardt, 2005). With reference to an engineers nature of work (section 2.4), it was explained why engineers must be equipped with enterprise skills. In fact, in the 1960s, there were about 10 universities in the United States which offered courses on this topic (Vesper, et.al., 1998). Since then, the number of schools with entrepreneurship programmes has increased significantly. In the 1990s, about 400 institutions offered programmes in entrepreneurship (Hills, et.al., 1998). The number is closer to 700 (Fiet, 2001) and there are more engineering research related to entrepreneurship (Leach et.al., 2005; Carlson, 2005; Stone, 2005; Dean, et.al., 2005; Dohn, et.al., 2005; Hamilton, 2005 and Chau, 2005). Therefore, the entrepreneur skills within engineers' curriculum are greatly in demand in the global market.

2.8 Human error vs project failures

According to the Design and Construction Industry's report (DPIC 2003), surprisingly, the restraining forces that bind us have a great deal to do with the non technical matters of engineering.

As graduate engineers enter the work force, most are excited about their first post-college challenges. Technically prepared, they expect that the most significant challenge they would face would be acceptance by their more technically experienced colleagues. Most graduates, however, are unprepared for the interpersonal, social and cultural challenges that also are a common part of technical project work (Hayden, 2006).

Hayden, suggested that causal factors appear to inhibit engineers from initiating and continuing dialogue to proactively explore anticipated project conflict. The causal factors included:

1. the lack of required ABET-certified university engineering courses that address Human System Engineering Knowledge and skills.
2. traditional professional biases relative to conflict.

3. the perception of how others might react to the proactive identification of anticipation project conflict in the absence of a clear and present crisis.
4. an apparent lack of competency in engineering management skills to enable proactively addressing interpersonal situations that require mastery of active listening skills, focusing on understanding and validating the expectations of major stakeholders involved.
5. the fact that most engineers are not owners of the firms they work in can lead to questions of professional ethics and business practice ethics accountability.

It appears that project failure due to underdeveloped human systems management begins at the academic stage of the engineer's career. Introducing the human systems side of engineering practice during the educational phase may be an effective start to improving sustainable positive increases in project outcomes.

Most building failures are the result of human error, they are not due to a lack of technical knowledge, according to Kaplan (1996) and others. While building failure forensics point to certain technical matters of design and/or construction, analysis of the failures also identifies the processes and procedures relating to how decisions were actually made and communicated (Kaplan, 1996). Examples of project failure are the collapse of the Quebec Bridge in the early 1900s (Heery, 2001) which 75 persons were killed and 11 seriously injured; Kansas City, Missouri, Hyatt Regency Walkway collapse during dancing for the opening reception on July 17, 1981(Levy and Salvadori, 2002) leaving 114 dead and 200 seriously injured; collapse of pre-engineered roof girders

(Kaplan, 1996) and Summerland Leisure Center Fire, 50 people died and almost as many were seriously injured in a fire at a 5000-person multifunction “leisure palace” in the United Kingdom during the early 1970s (Kaplan, 1996).

The researcher agrees with Hayden’s (2006) conclusion on the remarks on human errors vs project failure, as engineers should move from a belief that “I am right, you are wrong” to “how can we collaborate to handle different views” is a definable process. The professional’s lower-than-desired interpersonal communication skills level, when combined with a lower-than-desired level of trust in the management of an organization, can be the root cause of unacceptable project results.

2.9 Engineering and gender issues

Skills gaps occur amongst the genders too. It is reported that only 8% of engineering and technical workers are female (Pollitzer, 2007). Global sourcing, outsourcing and off shoring is a short term or temporary solution for the skills gap issues. 50% of the companies surveyed by the Institute of Engineering and Technology (IET) recruited from overseas in the past 12 months to cover specific skills shortages and 71% faced problems in hiring experienced staff. Women are persistently under represented in the ITEC sector, with only one in five technology workers being female and the gender gap is increasing steadily.

Engineering globally remains one of the least gender-diverse professions in an era where equality of opportunity and diversity are near-universally accepted principles. Other researchers (Bagilhole et al., 1997; Greed, 2001) have characterized the engineering profession as run by men and sustained in their interest.

EPC global and an international engineering staffing company, recently collaborated with the Government-funded UK Resource Centre for Women in Science, Engineering and Technology (UKRC) on a survey to investigate the inadequate representation of women in all fields of engineering. The results of the survey indicated that, out of 2000 responses, civil engineers accounted for 10% of the respondent base and 28% of respondents overall were women. The actual level of female representation in engineering world wide has been estimated at 6-10%.

Women are also seriously under represented in the engineering industry (WISE, 2002). Only 20 % of engineering employees are female; 21 % of these employees are operators or assemblers and 71 % are clerical or admin staff. 6 % of professional engineers are female, and only 11 % of engineering managers are female (Labour Market Survey of Engineering Industry in Great Britain, 2002).

This is supported by the evidence (UCAS, 2005) there is a low take up of engineering by women and a decline of opting for vocational routes into industry. It is suggested that poor careers advice is another reason students are not attracted to engineering degrees (Bowen, et.al., 2007).

There are studies on the difference in salaries of male and female engineers. Castro, (1998) reported an occupation in which women held 10 % of jobs in 1995. Data from the National Science Foundation (1995), a study which focused on US residents who are employed full time as engineers included approximately 1.5 million college graduates of all ages in 16 engineering occupations (Lal, 1999). Within this population, the median salary for women was 13 % less than the median salary for men. This is consistent with the other results that show that the engineers' gap lessens significantly when women are compared with men with similar educational backgrounds and occupations (Hecker, D., 1998).

The intensification of industries in Malaysia has resulted in increased numbers of engineers, both men and women, working in various establishments including large industrial organizations. In the year 2002 statistics show that there are about 35,500 engineers in the country. They are included in the group of professional and technical workers which as a whole accounted for 10.6 percent of the total employed population in the country (DOS, 2000).

Early industrial employment of women can be described as a situation where women were employed in female occupations such as caring and service, which were poorly rewarded both in pay and recognition. This employment was noted for its difference from the male pattern, in that women worked part-time, for discontinuous periods, at the bottom of the wage hierarchy, while men held permanent, full-time posts.

In other words, women adhered to the transitory and spiral patterns, while men saw themselves as following steady-state or linear careers. Today's changes and challenges have had little effect on the career pattern between men and women. Some changes, however, have been seen in terms of an increasing number of women who have broken through the glass ceiling, enjoying the remuneration, security, promotion and rewards in the job hierarchy (Tang, 1997; Sherwood, 1994). One of which is in the male-dominated profession of engineering.

Historically the image of engineering has been heavy, dirty and involving machinery. Both women and men have seen engineering as a masculine profession. Until recently some change has "softened" the field and hence is attracting more and more women. For instance, the total number of professional women in engineering in United Kingdom is expected to reach to 12 percent by the year 2010 from 4.6 percent in 1990 (Evetts, 1998); similarly, there have been progressive increases of female engineers in the USA from 5.8 percent in 1983 to 10.6 percent in 1999 (Catalyst, 1999; SWE national, 2001) or as a whole including technologist and technicians the total in the country is 18.6% (Bruner, 1998). In Malaysia, women engineers accounted for less than 10 % of the total professional workforce despite the encouraging number of Malaysian girls enrolling in the field of engineering, locally and abroad (Ismail, M, 2003).

A study by Ismail, (2003) revealed that there are some areas of specialization in engineering areas suitable for women. The areas are instrumentation, chemical, process and design engineering. The areas that women have a lot of limitations as perceived by men are mechanical, civil and automotive engineering. The notion is that engineering is still a male dominated job.

The issue of marriage and the suitability of women in building a career in engineering have often been discussed widely (Evetts, 1998; Tang, 1997). Women engineer's performances are affected most when they got married. Pregnancies and taking care of young children are two important factors said to slow down their career.

2.10 Pedagogic approaches towards the development of interpersonal and enterprise skills.

Whilst it is not the main thrust of this work to investigate all existing approaches, the researcher will present a range of literature in this field. The impact of the learning environment and the culture of an engineering school in achieving the goals of an engineering programme are to foster potential innovators, enterprise and interpersonal skills. Given that performance depends upon the individual, the task and the environment (Boyatzis, 1982), developing innovative ability will depend upon the programme (the skills and knowledge developed), the nature of the learning task and how they are constructed and assessed (the stated and tacit reward systems) and the school culture, including socialization and 'hidden' curriculum. Therefore, an appropriate approach should be defined to develop the engineering manpower that industry needs.

According to Kolmos, (2002) development and change in education can occur at many levels, there are fundamentally two basic ones: firstly, the individual level, which focuses on changing the teachers' attitudes towards learning and teaching; and the second, the systematic level, which focuses on changing the overall foundation of the educational programme by instituting new objectives and methods of teaching and evaluation, along with efforts aimed at cultural change.

However, it is in fact difficult to enact changes in education without involving both levels. Nevertheless, different traditions within educational research and didactics have weighted the levels differently. Changing from a traditional educational programme to strategic approach learning models require conscious work at both levels. The process of facilitation should not only pave the way for the teachers to gain experience with the new model but perhaps more importantly it should also guide the practice of reflection throughout the change process. By providing reflection loops, academic developers can create awareness of past experiences and also encourage and support experiences of innovation and new teaching experiences. These reflection loops enable teachers to compare old experiences with new ones on the basis of further developing attitudes and new practices.

The facilitation of new models must take place on both a systematic level aimed at helping with such factors as establishing new structures and implementing organizational changes, as well as on the individual level.

The researcher will explore the learning and teaching approach in the next section. Does this approach contribute to interpersonal skill and enterprise skill development?

2.10.1 Bloom's Taxonomy.

Discussion on learning will almost certainly contain reference to Bloom's taxonomy of learning. "Taxonomy" simply means "classification", so the taxonomy of learning objectives is an attempt (within the behaviour paradigm) to classify forms and levels of learning. In 1956, Benjamin Bloom headed a group of educational psychologists who developed a classification of levels of intellectual behaviour important in learning. They identified three domains of educational activities; cognitive: mental skills (knowledge), affective: growth in feelings or emotional areas (attitude) and psychomotor: manual or physical skills (skills). The committee also produced an elaborate compilation for the cognitive and affective domains, but none for the psychomotor domain. Their explanation for this was they have little experience in teaching manual skills within the college level. Bloom found that over 95 % of the test questions students encounter require them to think only at the lowest possible level (the recall of information). It is suggested that a learner cannot effectively address higher levels until those below them have been covered; it is effectively serial in structure.

The major idea of the taxonomy is that what educators want students to know (encompassed in statements of educational objectives) can be arranged in a hierarchy from less to more complex.

Bloom identified six levels within the cognitive domain, from the simple recall or recognition of facts, as the lowest level, through increasingly more complex and abstract mental levels, to the highest order which is classified as evaluation. The taxonomy is presented below (Table 2.2) with sample verbs and a sample behavior statement for each level.

Anderson and Krathwohl (2001) revised Bloom's taxonomy and placed evaluating prior to creating. According to Huitt (2004), it is more likely that synthesis/creating and evaluation/evaluating are at the same level. Both depend on analysis as a foundational process. However, synthesis or creating requires rearranging the parts in a new, original way whereas evaluation requires a comparison to a standard with a judgment as to good, better or best. This is similar to the distinction between creative thinking and critical thinking. Both are valuable while neither is superior. In fact, when either is omitted during the problem solving process, effectiveness declines.

Source: Anderson and Krathwohl (2001).

Through the researcher reading, most of the new models of learning approach, still refer to Bloom's taxonomy. This can be found in outcome-based education, action learning, learning styles and problem based learning.

2.10.2 Outcome-based education (OBE)

Outcome-based education (OBE) developed out of the competency based movements of the 1970s (Spady, 1982). OBE approaches to course development have become popular within education systems catering for primary/elementary and secondary/high school education in Australia and elsewhere (Willis & Kissane, 1995; Brady, 1996). It is claimed that OBE provides a means for meeting the needs of all students irrespective of their social and cultural 'position', or location (Spady, 1982; Capper & Jamison, 1993). In addition, proponents of OBE claim that it provides a clear teaching and learning focus through improved instructional and assessment methods (Spady, 1982).

In those countries that have adopted OBE, there is a considerable debate and discussion about how best to implement courses and programmes which foster the acquisition of the stated graduate attributes. Effective and efficient methods of measuring outcomes are still being developed and refined. Students should be informed about attitudes that underpin innovation and entrepreneurship and their relationship with relevant skills and knowledge, as part of their personal development and self awareness. The American Society of Civil Engineers (ASCE, 2004) observe that, if there is a lack of attention paid to attitudes in the teaching and learning efforts of universities, in concert with industry, then there is a danger that undesirable attitudes will be encouraged, to the detriment of all.

2.10.3 Action Learning

Action learning is a continuous process of learning and reflection, supported by colleagues, with an intention of getting things done. Through action learning individuals learn with and from each other by working on real problems and reflecting on their own experiences. The process helps us to take an active stance towards life and helps to overcome the tendency to think, feel and be passive towards the pressure of life (Mc Gill and Beaty, 2001).

Action learning is based on an experiential learning cycle (Kolb, 1984; Pedlar et al., 1986). This learning cycle, is also a problem-solving cycle and a management learning and development cycle (Bourner et.al., 1992).

2.10.3.1 How action learning works.

In action learning, groups are made between four and seven participants called a set. There is usually a facilitator called a set adviser. The set typically meets once or twice a month over six to twelve months for meetings which last between two and seven hours. The exact pattern will depend on the nature of the projects and the program, the participants' availability and practical issues relating to the size of the group. The main features of action learning are: collaborative learning- it is essentially a group based process; projects are linked to the real world of experience either for personal and/or organizational development; action planning and evaluation are emphasized as personally constructed rather than given by an expert and it uses processes which enhance development of interpersonal skills.

2.10.3.2 What is the strength of action learning?

- A deep approach.

Research in Sweden and UK in the late 1970s and early 1980s looked at student learning from the point of view of different approaches that students had when studying. A basic distinction was between those who took a deep approach and those who took a surface approach (Marton et. al., 2000). In a deep approach the learner is intent on understanding a message in a text or making connections between experience and new ideas. In a surface approach the learner is simply trying to gather information one bit at a time.

- An intrinsic orientation

The intrinsic orientation is where the course was seen as an end in itself, for example for vocational orientation and as training for a job. These were: vocational orientation, academic orientation, personal orientation and social orientation (Beaty et.al, 2000).

- Fear of Failure

A good deal of research on student learning has been concerned with the anxiety that the assessment system brings to students and the problems that some students have with poor performance under pressure. Fear of failure is also a strong motivator and some students work hard due to this motivating force. Overly strong anxiety however is debilitating (Entwistle and Wilson, 1977).

2.10.4 Learning styles.

Students have different strengths and preferences in the ways that they take in and process information. Some prefer to work with concrete information (facts, experimental data), while others are more comfortable with abstractions (theories, symbolic information, mathematical models). Some prefer visual presentation of information i.e. pictures, diagrams, flowcharts, schematics etc. and others get more from verbal explanations. Some like to learn by trying things out and seeing and analyzing what happens and others would rather reflect on things they plan to do and understand as much as they can about them before actually attempting them. When the learning styles of most students in a class and the teaching style of the educator are seriously mismatched, the students are likely to become uncomfortable, bored and inattentive in class, do poorly in tests, became discouraged about the subject, the curriculum and themselves and in some cases change to other curricula or drop out of their course (Felder, et.al., 1988; Felder, 1996).

In 1988, Richard Felder and Linda Silverman formulated a learning style model designed to capture the most important learning style differences amongst engineering students and provide a good basis for engineering instructors to formulate a teaching approach that addresses the learning needs of all students (Felder, et.al., 1988, Felder, 1993). The model classifies students as having preferences for one category or the other in each of the following four dimensions:

Firstly, sensing (concrete thinker, practical, oriented toward facts and procedures) or intuitive (abstract thinker, innovative, oriented toward theories and underlying meanings); Second, visual (prefer visual representations of presented material, such as pictures, diagrams and flow charts) or verbal (prefer written and spoken explanations); thirdly, active (learn by trying things out, enjoy working in groups) or reflective (learn by thinking things through, prefer working alone or with a single familiar partner); and fourth, sequential (linear thinking process, learn in small incremental steps towards large and overall) or global (holistic thinking process, learn from large towards more small details).

The active/reflective dimension is analogous to the same dimension on the learning styles model of Kolb (1984). The active learner and reflective learner are respectively related to the extravert and introvert of the Myers-Briggs Type Indicator (Lawrence, 1994). The sensing/intuitive dimension is taken directly from the MBTI. It may have a counterpart in the concrete/abstract and visual/verbal dimensions have some analogs in the visual-auditory-kinesthetic formulation of modality theory (Barbe, et. al., 1979) and neurolinguistic programming (Bandler, 1979) and the visual/verbal distinction is also rooted in cognitive studies of information processing (Crowder, 1992).

Having a framework for identifying the different types of learners can help an instructor formulate a teaching approach that addresses the needs of all students. Studies have shown that greater learning may occur when teaching styles match learning styles than when they are mismatched (Felder, 1988; Schmeck, 1988; Hayes, et.al, 1993; Hayes, et al., 1996). A strong case can be made against teaching exclusively to accommodate learning styles preferences.

Previous research (Yeung, et.al., 2006) has provided evidence demonstrating, through group-based activities that appropriate learning styles are desirable given the importance of well-developed communication skills in most areas of work. An empirical study (Ramsay, et.al., 2000) has reported that students with extrovert (assertive person) and feeling (emotion) characteristics have a high preference for collaborative activities. Thus, the introduction of collaborative learning activities such as peer-assisted study sessions (Miller, et.al., 2004) or group-based assignments appeal to highly extrovert students who prefer to actively engage in the subject by interacting with others.

2.10.5 Problem based learning (PBL)

The aim of the PBL approach is to provide students with the opportunity to develop learning skills and attitudes that would equip them with the skills to become more effective students as well as independent lifelong learners (Chau, 2005). A PBL approach normally incorporates three categories of learning: cognitive, skills and attitudes. It helps enhance student critical thinking and allows them to have opportunities to function more effectively in discussion and group work. Moreover, they are directed to develop attitudes on taking responsibility for their learning. This innovation is anticipated to empower students in their learning and personal development. In a PBL approach, students are in the core of the system and take the initiative in their learning.

Savin-Baden (2000) defines five different modes of PBL from a cognitive perspective: epistemological competence; professional action; interdisciplinary understanding; transdisciplinary learning; and critical contestability. These modes cover objectives, problem scenario, learning, actors and assessment.

The pedagogical system is designed such that students have to learn on their own and teaching is a matter of facilitating students' learning. Students are expected to identify and fulfill their own learning objectives, through gleaning knowledge with all available resources. Woods (1994,1997) suggested several tasks for the students to work through during the process: explore the problem; create hypotheses; identify issues; formulate a trial solution; identify the requisite knowledge; prioritize the learning needs; allocate resources; identify tasks of team members; search for knowledge; share the new knowledge; formulate an update solution; give feedback on effectiveness; reflect on the process (Barrows, 1986; Gallagher et.al. 1995). Therefore, students in a PBL classroom must seek information, access learning material and communicate acquired knowledge to other students and teachers while they work in small groups with ill-structured problems (Rosing, 1997). PBL has been employed in a variety of subject areas, particularly in the medical field (Blayney, 2003, Morris, 2003).

During the past few years, there has been a substantial amount of research and educational efforts in PBL in the engineering domain. Feland and Leifer (2001) summarized a method for volatility measurement as an assessment instrument for design team performance prediction within a PBL environment. Cockayne et. al., (2003) delineated the development of the classification and its application in a comprehensive problem based learning program. Fruchter and Lewis (2003) addressed the Architecture/Engineering/Construction (A/E/C) industry's need to broaden the competence of engineering students to utilize the acquired theoretical knowledge and understand the role of discipline-specific knowledge in a multi-disciplinary A/E/C (PBL) learning environment. Zolin et. al., (2003) presented key characteristics of a problem based learning environment that determines its suitability as a data source for work related research studies. Kolmos, (1996) defines and compares project organised learning and problem based learning in her study.

The results of research on PBL revealed that students become better learners in terms of time management skills and their ability to define topics, access different resources and evaluate the validity of these resources (Galagher et al., Kroynock & Robb, 1996). Moreover, PBL appears to improve critical thinking, communication, mutual respect, teamwork and interpersonal skills and increase students' interest in a course (Achilles & Hoover, 1996; Gordon et. al., 2001; McBroom et al., 2001; Sage, 1996; Savoi & Hughes, 1994; West, 1992).

2.10.6 Other approaches.

Besides the approaches discussed above, many other researchers and practitioners in engineering education have tried to develop new approaches which are more innovative and creative in developing students' transferable skills development. Magill et.al., (2007) in their study suggested an integrated approach to teaching and learning via public engagement. The aim was to develop engineering activities to improve perceptions and understanding of what engineering (specifically electrical engineering) is about. The project work represents collaboration between the Faculties of Education and Engineering at the University of Glasgow. This project was funded by the Engineering and Physical Science Research Council (EPSRC) under their partnerships for Public Engagement (PPE) from 2001-2004. Through workshops the engineering students presenting semiconductor technology in daily use to a wider audience. The project benefited the students in terms of deeper understanding of the topic through a creative vehicle. Students have the opportunity to work with external organizations and to develop transferable skills such as communication, presentation, project and time management. The students work to be of value and endure beyond the confines of the academic environment. Finally, this approach has successfully brought together a diverse group with the principal purpose of producing creative output.

2.11 Summary

This chapter has explored and highlighted definitions and terms of engineering, skills gaps and the nature of work of an engineer. The researcher has highlighted employability competencies, employment and curriculum, engineering graduate and employment, and comparison of engineering graduates in Malaysia and developing countries such as South Africa and India. Literature on employers' needs and skills needed by employers are highlighted. The role of the Malaysian Higher Education Institutions as well as generic skills and policy are explored. Literature related to the importance of interpersonal skills and enterprise skills to engineers are highlighted by the researcher. Gender issues in engineering were presented through previous research and finally, learning models or approaches towards the development of interpersonal skills and enterprise skills for example Bloom's taxonomy, outcome-base education, action learning, learning styles and problem based learning are explored and their impact on interpersonal skills and enterprise skills development and improvement.

The researcher found that although other researchers have touched on issues relating to generic skills they have been discussed generally. There is no specification as to interpersonal or enterprise skills. The researchers agreed that interpersonal and enterprise skills are important to engineers today, but they have not investigated them further.

The research into these skills is done either through quantitative or qualitative methods. If it is done through a quantitative method, the instrument invariably used to measure is a survey questionnaire. Through previous research found that the outcome for this kind of research usually is positive or supporting the researchers' opinion related to the study. It usually does not reflect the actual situation in the population. The respondents show what the researchers wanted to see, not the actual fact.

The qualitative research done by previous researchers utilized individual interviews. This method emphasizes details and delivers rich data from respondents but the argument is that using one method does not contribute to the robustness of the study.

Therefore, based on this argument, the researcher decided to further the investigation on interpersonal and enterprise skills amongst engineering students by utilizing a mixed methodology to increase the robustness of the study.

The next chapter will explore the appropriateness of the chosen methods and achieve the objective of this research.

CHAPTER 3

DEVELOPMENT OF A RESEARCH FRAMEWORK

3.0 Overview

Based on the literature review described in Chapter 2, there is a requirement for a methodology to analyse interpersonal skills and enterprise skills required of engineering students in employment. The aim of this chapter is to give a detailed description of the proposed methodology for the design of a Generic Transfer Questionnaire (GTQ) in order to establish the employability requirement.

The researcher's aim is to examine the extent of the engineering programme, industrial training and university life and co-curriculum activity offered to engineering students. Do these schemes help promote interpersonal and enterprise skills towards employability?

In this chapter, the researcher discusses the research framework chosen, choices of methodology, and research design in terms of how to define the population and samples. This chapter also discusses the research instruments used which is to design questionnaire surveys and interviews for the data collection strategies. Finally, the validity and reliability of these instruments of investigation are discussed.

3.1 A research framework

A paradigm (framework) is a way of looking at the world (Mertens,1998). Guba and Lincoln (1994) identify three questions that help define a paradigm:

i. The ontological question asks; What is the nature of reality?

ii. The epistemological question asks; What is the nature of knowledge and the relationship between the knower and the world-be known?

iii. The methodological question asks; How can the knower go about obtaining the desired knowledge and understandings?

The positivism framework underlies quantitative methods, while the interpretive paradigm underlies qualitative methods (Guba & Lincoln, 1994; Howe, 1998). This research utilized two paradigms alongside each other in order to understand and explore the engineering employability competencies.

The metaphor of paradigm wars described by Gage (1989) is undoubtedly overdrawn. Describing the discussions and altercations of the past decade or two as wars paints the matter as more confrontational than necessary. A resolution of paradigm differences can occur only when a new paradigm emerges that is more informed and sophisticated than any existing one. This is most likely to occur if and when proponents of these several points of view come together to discuss their differences.

3.1.1 Positivism

Positivism is based on the rationalistic, empiricist philosophy that originated with Aristotle, Francis Bacon, John Locke, August Comte and Emanual Kent. The underlying assumptions of positivism include the belief that the social world can be studied in the same way as the natural world, that there is a method for studying the social world that is value-free and the explanations of a causal nature can be provided (Merten, 1998:7).

3.1.2 Interpretive

Silverman suggests that the interpretative is 'the primary issue is to generate data which gives an authentic insight into people's experiences' (Silverman, 1993). While the interpretive does not suggest that there is;

> 'a singular objective or absolute world out-there' … [they] do recognize 'objective worlds.' Indeed, they contend that some objectification is essential if human conduct is to be accomplished. Objectivity exists, thus, not as an absolute or inherently meaningful condition to which humans react but as an accomplished aspect of human lived experience (Dawson and Prus, 1995: pg. 113).

Research cannot provide the mirror reflection of the world that positivists strive for, but it may provide access to the meanings people attribute to their experiences and social worlds.

3.1.3 Methodological choice

As this research will consider employing positivism and interpretive frameworks, the methodology needs also to consider the quantitative and qualitative methods.

3.1.3.1 Quantitative methods.

A quantitative method is defined as an inquiry into a social or human problem, based on testing a theory composed of variables, measured with numbers and analyzed with statistical procedures, in order to determine whether the predictive generalizations of the theory hold true. The literature has illustrated that engineering graduates have difficulties to promote themselves in a job market (MTEN, 2006). Therefore, an investigation was launched to explore the true picture of the situation.

As for the ontological issue of what is real, the quantitative researcher views reality as “objective”. Here, the researcher wants to know how things really are and how things really work in the studied population (Guba & Lincoln,1994). Something that can be measured objectively by using a questionnaire or an instrument. The Generic Transfer Questionnaire (GTQ), measures the ontological (the nature of reality) issue with a Likert scale range. Then, the researcher can run the descriptive analysis and Exploratory Factor Analysis (EFA) to measure the construct of the tools (Generic Transfer Questionnaires) utilized in the study.

Regarding the epistemological question; dealing with the relationship of the researcher to that being researched, the quantitative approach holds that the researcher should remain distant and independent of that being researched (Denzin & Lincoln, 1994). The axiological issue of the role of values in a study ensures the researcher's values are kept out of the study in a quantitative project. Facts are reported through the evidence gathered in the study.

The rhetoric or language of the research warrants that the quantitative researcher must not only be impersonal and formal but also based on accepted words such as relationship, comparison and within-group. Concepts and variables are well defined from accepted definitions.

3.1.3.2 Qualitative methods.

Qualitative methods are used in research that is designed to provide an in-depth description of a specific program, practice or setting. Qualitative research is multi-method in focus, involving an interpretive, naturalistic approach to its subject matter (Guba & Lincoln, 1994). This means that qualitative researchers study things and attempt to make sense of, or interpret phenomena in terms of the meanings people bring to them. Qualitative research involves the studied use and collection of a variety of empirical materials such as case study, personal experience, introspective, life story, interview, observational, historical, interactional and visual texts that describe routine and problematic moments and meanings in individuals' lives. (Denzin & Lincoln, 1994).

The ontological issue in a qualitative method of what is real is that the only reality is that constructed by the individuals involved in the research situation. Here the researcher needs to report faithfully these realities and to rely on voices and interpretations of informants.

On the epistemological question, the researchers interact with those they study, whether this interaction assumes the form of living with or observing informants over a prolonged period of time, or actual collaboration. In-short, the researchers try to minimize the distance between themselves and those being researched.

On the axiological issue, the qualitative investigator admits the value-laden nature of the study and actively reports their values and biases, as well as the value nature of information gathered from the field.

On the rhetoric or language of the research, words such as understanding, discover and meaning form the glossary of emerging qualitative terms. Moreover, the language of qualitative studies becomes personal, informal and based on definitions that evolved during a study.

Reichardt and Rallis (1994) argue that positivism and the interpretive share more compatibility than incompatibility and that depiction of paradigms emphasizes differences more than similarities. Each paradigm brings strengths that can complement in the other weakness. Brewer and Hunter (1989) described 'a diversity of imperfection' in the following quote:

> Social science methods should not be treated as mutually exclusive alternatives among which we must choose…. Our individual methods may be flawed, but fortunately the flaws are not identical. A diversity of imperfection allows us to combine methods… to compensate for their particular faults and imperfections. (pg.16-17)

Therefore, it is wise to carry out a mixed-method approach so that the researcher could gain an understanding of the constructs held by people in the context of the study.

This mixed-method study uses triangulation techniques. Methodological triangulation involves the use of both qualitative and quantitative methods to study the same phenomena within the same study (Denzin, 1978; Patton, 1990). Campbell, a pioneering methodologist promoted the concept of triangulation; that every method has its limitations and multiple methods are usually needed. According to Denzin, (1978) the term triangulation in a book on sociological methods, refers to a surveying/nautical process in which two points (and their angles) are used to determine the unknown distance to a third point. Denzin's concept of triangulation involved combining data sources to study the same social phenomenon. For this study, the researcher should implement methodological triangulation to add rigour.

There are several purposes for choosing a mixed methods study: (a) triangulation, or seeking convergence of results; (b) complementarity, or examining overlapping and different facets of a phenomenon; (c) initiation, or discovering paradoxes, contradictions, fresh perspectives; (d) development or using the methods sequentially, such that results from the first methods add breath and scope to a project. Therefore, to compliment strength and to reduce weaknesses, the researcher proposes to use a mixed method for this study.

3.2 Research design

3.2.1 Research scope

In this section, the researcher starts from the Malaysian education background; the economic crisis in 1997 and their relation to the labour market climate. Factors such as the supply of graduates in the labour market and employment growth may aggravate further the unemployment situation of graduates. Measures undertaken by government to address unemployment amongst graduates are highlighted.

The National Education System of Malaysia was inherited from the British colonial government. However, the policy outlined in the Education Act of 1961 was a result of clearly thought out strategies aimed at revamping the fragmented education system of the British colonial era, with the main objective of achieving national unity and development through education.

National unity was very important to Malaysia because of the existence of multiracial societies such as Malays, Chinese, Indian, Dayak, Iban and others. All the races must remain harmonious and unified and an education system can promote racial unity. It is clear that Malaysia has taken the stance that educational values should be an integral part of the school curriculum, and that values are to be firmly based on religious values. Malaysia believes that all education is values education oriented. Specifically, the importance put on values reflects the notion that, for individuals to be truly developed, they have to be balanced in terms of their intellect, spiritual, physical as well as emotional well being, which is based on values. It can be assumed that some form of values education, no matter how informal, was given in schools, since all education is in fact moral education, as "… all the experiences that pupils have in schools have a morally educative effect" (Downey and Kelly, 1986: 168).

The Education Act was to be implemented in stages, to ensure a gradual transition. It was this gradual implementation of the Education Act, which characterized educational development and curriculum changes in the early decades after independence. In essence, it was a gradual change from the British (English School) type of education to a Malaysian education system, with a Malaysian outlook and Malaysian oriented curriculum.

At the end of the 1970s, after undergoing changes in the curriculum and system as a whole, all schools used Bahasa Malaysia (Malay language) as the medium of instruction (except at a primary level which was provided in the Education Act) and comprehensive education was provided for nine years (11 years at present). The changing emphasis during this period reflected the importance given to science and technology, in the light of economic development of the times. The system of education can be described as providing basic education at the elementary level, general comprehensive education at the lower secondary level and semi specialized at the upper secondary level. Specialization as preparation for university was done in Grades 12 and 13 or the pre-university level, at the end of which students sit for the Malaysian Higher School Certificate of Education Examination.

Pre-university education consists of two years of specialization in preparation for students to enter university, although in essence, students treat it as another step in education. For some, pre-university education is in the form of matriculation classes of a particular university. In some cases, students enter the universities for integrated programs which allow them to graduate with Diplomas (in the Malaysian context diplomas are one step lower than fully fledged degrees) or be converted into the degree programmes, which ultimately enable them to graduate with bachelor's degrees. For those preparing to enter foreign universities, they sit for the A-Levels, Associate American Degree Programmes, or Australian Matriculation Programmes.

At the end of the 1970s, the government felt that it was time to review whether the system's evolution was meeting the needs of a progressive Malaysian nation. Once again an Education Review Committee was set up under the then Honorable Minister of Education, Dr. Mahathir Mohammad (former Prime Minister of Malaysia). The report, released in 1979, now popularly known as the Cabinet Committee report, was a result of a very comprehensive study of the education system as spelt out by the Education Act of 1961.

The Cabinet Committee Report (1979), is in essence in line with what is later declared by the ex-Prime Minister as the Vision 2020 (Mahathir, 1991). Although the Cabinet Committee Report did not delineate a new education policy, the emphasis shifted towards building a truly Malaysian society of the future. To that effect, it emphasizes at all levels of schooling, a holistic (intellectual, spiritual, physical and emotional) approach to quality human development to ensure development from all domains i.e. cognitive, affective and psychomotor. As stated in the National Educational Philosophy:

"Education in Malaysia is an ongoing effort towards further development of the potential of individuals in a holistic and integrated manner, so as to produce individuals who are intellectually, spiritually, emotionally and physically balanced and harmonious based on a firm belief in God. Such an effort is desired to produce Malaysian citizens who are knowledgeable, who possess high moral standards and who are responsible and capable of achieving of the nation at large (Ministry of Education, 1993)".

In implementing the recommendations, the Malaysian Curriculum Development Centre set up machinery to draw up a syllabus for moral education. In doing this, much care was taken to include values that reflect Malaysian society, which are acceptable to all and do not offend any group. The government has made a bold statement that quality individual (human) development is to be firmly founded in the teaching of values education, which in turn is based on a "firm belief in God". No excuse is made for the inclusion of religion in the curriculum and no issue is made of whose values to teach. Acknowledgement is made to the existence of the difference beliefs and religions but the underlying philosophy is that all religions profess the same things as good and evil and more importance is given to similarities between different people rather than their differences.

A committee was set up to work on the syllabus, the members of which include the curriculum officers, representatives from all religious groups, as well as consultants from the universities. The outcome from the National Institute of Education (NIER) Tokyo and UNESCO which undertook to discuss and identify core values universally accepted (Mukherjee, 1986) are taken into consideration. Finally, a total of 16 core values (which are again detailed as the core content of the moral education and approved for implementation in the KBSR (elementary level) and KBSM (lower and upper secondary level). The list of values is in Appendix 1). These values are derived from religions, traditions and customs of the people, while taking into consideration universal aspects. They relate to human relationships in everyday life, particularly relevant to relationships with the family, peer group, society as well as the organization.

To this effect too, the teaching of values is emphasized in the curriculum, not only through the direct teaching of the subject (Islamic Education and Moral Education), but also to be integrated into the teaching of other subjects (values across the curriculum).

The Education Act 1996 has endorsed the existence and function of private education, especially private tertiary institutions to complement that of the public higher education institutions. The Act outlines policies in order to impose some form of control on the quality of higher education, such as provision for the establishment of the Lembaga Akreditasi Negara (National Accreditation Board), as well as content which imposes the Malaysian context. It also has the underlying objective of making Malaysia the center of educational excellence in the region without compromising the development of the Malaysian citizenry with Malaysian values. The latest is that all higher institutions of education, including private institutions are to include Islamic and Asian Civilization into the curriculum, besides Malaysian nationhood which was identified earlier.

Malaysia has experienced five economic downturns between 1980 and 2002 which were in November 1982, January 1985 to November 1986, January 1992 to January 1993, March 1996 to November 1998 and August 2000 to February 2002.

During the period preceding the crisis from 1991 to 1997, Malaysia experienced several years of rapid economic growth with the real gross domestic product (GDP) growth of 8.5 % and unemployment rate at a record low of below 3 %. The financial crisis that started in mid 1997 has affected the Malaysian economy. The impact was evident with the economic growth measured in real GDP beginning to slow down and registered the first negative growth since 1985 of -7.4 % in 1998. Table 3.1a and 3.1b, illustrates real GDP growth, labour force and unemployment from 1996-2006.

Table 3.1a: Real GDP growth, labour force, employment, unemployment, labour force participation rates in Malaysia, 1996-1998. (both tables removed)

	1996	1997	1998

Source: Economic Report, Ministry of Finance

Table 3.1b : Real GDP growth, labour force, employment, unemployment, labour force participation rates in Malaysia, 2004-2006.

	2004	2005	2006

Source: Economic Planning Unit

Prior to the financial crisis, with double-digit growth, the manufacturing sector was the engine of growth and the main contributor towards employment creation. After the financial crisis, however, as noted in the White Paper published by the Economic Planning Unit of the Prime Minister's Department, Malaysia, the manufacturing sector contracted sharply by -10.2% in 1999. Other sectors also experienced negative growth with the exception of the service sector that recorded a marginal increase of 1.5% growth.

The contraction in real GDP affected the labour market resulting in slower employment growth, increases in the unemployment rate and also redundancy rates. The labour force registered negative growth of 2.1% and employment declined by 2.8% in 1998 compared to a positive growth of 4.9 and 4.6% in 1996 and 1997, respectively. In the same year, unemployment experienced a slight increase standing at 3.1%. Redundancy increase highly to 83,865 workers in 1998 compared to approximately 19,000 in 1997. In 2006 as shown in Table 1b, the real GDP growth reduced to 5.3% compared to 7.2% in 2004. In the same year, the rate of unemployment increased to 3.5%.

Besides real GDP growth and unemployment, it is interesting to see the type of signals transmitted by the other labour market indicators to the policy makers. An important statistic that provides insights of the supply side is the output of graduates from the public and private institutions.

There have been an increasing number of public and private higher education centres being set-up offering generic or partner's undergraduate programmes in engineering. Throughout Malaysia, there are 20 public universities and 14 private universities. These higher institutions offer Bachelors degrees, Masters degrees, PhD degrees and certificate and diploma programmes. There are also 21 polytechnics and 34 community colleges that provide certificate and diploma level programmes. The higher education institutions offer various fields in the arts, science and technology and vocational.

The Educational Statistics from the Ministry of Higher Education shows that graduates with a diploma and above from public institutions continued to increase from 19,208 graduates in 1996 to 79,566 graduates in 2005. Those graduating from public institutions represent 55.3 to 65.1% of total output during the period 1996 to 2005.

In terms of the field of study, the proportion of arts graduates at all levels is higher than science and technical graduates. In 2001, two schemes were introduced by the government, which provide the facility for graduates to further their studies in the form of allowance or loan. In line with these special schemes, the proportion of master graduates particularly in arts increased from 61.7% in 1997 and reached its peak at 70.3% in 2002. The distribution of enrolment and output of graduates by field is shown in the following Table 3.2:

Private institutions also contribute in producing graduates. Table 3.3 above illustrates the number of graduates supplied by the private institutions. With the growth of private institutions, the number of graduates from here cannot be ignored particularly those graduating with a diploma. Private HEI reached its peak in 2002 at 55,988. Compared to government HEI bachelor's degree, the output of success rates from private HEI bachelor's degrees is 50% less.

The distribution of employment by category of occupation indicates the source of employment for graduates in terms of category. According to the Malaysian Labour Force Surveys, the professional, technical and related category and administrative and managerial categories did not grow as much to accommodate the increase in graduates, growing by only 0.3% in 1998. From 1998 to 2000, the percentage share was hovering between 14.5 and 14.6%. A new classification of occupations was used in the Labour Force Surveys from 2001 onwards to suit the changes in the economy, technology and development of the nation. In line with the economic recovery, the percentage share for equivalent categories increased by 1.5% from 24.3% in 2001 to 25.8% in 2002. Nonetheless, the increase of job opportunities was still not enough to cushion the number of graduates entering the labour market.

Employment growth by sector will indicate the sector that generates employment opportunities. As a result of the 1997 financial crisis, overall employment did not show a marked decrease. However, immediately after the crisis, the employment growth in the manufacturing sector recorded a negative growth of 0.6% in 1998. The manufacturing sector made a come back in 2000 with a 9.2 % growth but later recorded a slight decrease of 0.1 % in 2001.

The bulk of the employment in the manufacturing sector is in the electrical and electronic industries which contributed between 30 and 40% of total employment. Within the electrical and electronics industry, the manufacturing of semiconductor devices, electronic valves and tubes and printed circuit boards and television and associated goods formed a large portion of employment with approximately 60% in 2002. The slow down of the electrical and electronic industries in 2001 resulted in a negative 0.1% growth.

Towards the end of 2001, the electrical and electronic industries started to recover. As a result, the manufacturing sector recorded 4.9% growth in 2002 and 5.0% growth in 2003. Though affected by the economic slow down, the service sectors still recorded positive growth. In 2001, the service sectors reached its peak in terms of growth standing at 26.3%.

The Labour Department, Ministry of Human Resources provides free employment services to job seekers and employers and registration is voluntary. The employment register maintained by the Labour Department represents only a small portion of the labour market actors namely the active job seekers and registered vacancies of participating employers. Nonetheless, it provides signals of the labour market situation. In the register, graduate registrants refer to jobs seekers holding a diploma and above whilst graduate vacancies refer to jobs requiring graduates having a diploma and above qualification.

Prior to the crisis in 1996, graduate active registrants represented 6.3% of the total registrants. The proportion of graduate active registrants increased from 9.3% in 1997 and peaked at 21.2% in 2001. The proportion of graduate active registrants showed a declining trend representing 15% and 9.8% of the total registrants in 2002 and 2003, respectively.

The number of registered vacancies for graduates, however, fluctuated between 1.6 to 2.4% of total vacancies reported to the Labour Department. The supply data represented by the number of graduate job seekers were much higher compared to the demand data as depicted by the number of vacancies. The widest gap was in 2001 with 21.2% active graduate registrants compared to 1.5% vacancies for graduates. But this gap in 2006 has grown to 48.2% active graduate registrants compared to 12.4% vacancies for graduates. The distribution of active registrants and vacancies registered with the Labour Department from 1996 to 2007 is shown in Table 3.4.

The number of vacancies for graduates is relatively very low (because it is voluntary) compared to the available active registrants. Nonetheless, to a certain extent, it can be attributed to the mismatch between job seekers qualifications and requirements of the industry. In tandem with the economic situation, the vacancies rate will move accordingly. For example, the vacancies rate dropped to 10.5 and 9.4% in 1998 and 1999 respectively from 18% in 1997.

It should also be noted that a few other indicators also influence to a certain extent the unemployment situation of graduates. The White Paper highlighted three concerns of the government of which two were related to graduate unemployment. The first concern was economic growth exceeding potential output. Since 1991, the economy has consistently grown above its potential output as reflected by investment persistently exceeding savings, increasing demand for foreign labour, widening current account deficit of the balance of payments and wage increases exceeding productivity gains. Even during the period of economic growth, most of the jobs created were lower skilled or unskilled jobs as evidenced by the high demand for foreign labour.

The second concern was the declining trend of total factor productivity (TFP) as a benchmark of efficiency level. Its contribution to real GDP dropped to 19.5 % during 1996-1997 from 28.7% during 1991-1995. The White Paper noted that the decline is associated with the transition of the economy to high technology and knowledge-based industries, which in the initial stage requires rapid capital formation. This means not as many jobs are created at this stage of formation.

Generally as mentioned earlier, the Malaysian government has taken several measures to address the cyclical nature of unemployment and some attempts to address structural unemployment. By providing, entrepreneurial schemes, some basic skills of language, communication and additional skills such as computer skills, it is hoped that the unemployed graduates are ready to be employed within a short period provided the economy also show signs of recovery. Through the programme, it is hoped that this would create entrepreneurs and who would later be job creators themselves.

Referring to the economic crisis and other factors affecting unemployment of engineering graduates, the researcher would further investigate whether the suggested lack of interpersonal skills and enterprise skills has a correlation with the unemployment of engineering graduates in Malaysia. Thus, does the employer also contribute to the engineering student employability competency? Therefore, an investigation was needed to explore what the possibility might be.

3.3 Population/sample

3.3.1 Population.

There are two sets of population proposed in this study which are Malaysian engineering undergraduates and employers in Malaysia. The Malaysian engineering students identified in this study were from both government higher education institutions and the private higher education institutions. The institutions representing the government higher education institution are identified by University One (U1) and

University Two (U2). The private higher education institution is University Three (U3) and University Four (U4). These universities are identified by the allocated symbols in order to avoid any possibility of identification of the subjects of the research. The true names are not revealed to protect the respective respondents and institutions as agreed by all parties; the researcher, the institutions and the respondents. The final year engineering undergraduates have been identified for the sample in this research through probability random sampling.

3.3.1.1 Probability random sampling.

Probability random sampling provides the chances of members of the wider population being selected for the known sample (Cohen, et.al., 2000; Barbie 1990). The probability sampling will be useful if the researcher wishes to be able to make generalizations, because it seeks representativeness of the wider population. Probability sampling has less risk of bias.

3.3.1.2 Stratified random sampling type

A stratified sampling is a method for obtaining a greater degree of representativeness. A sample is obtained by separating the population elements into groups, or strata, such that each element belongs to a single stratum. The researcher then selects a random sample from each stratum. Stratified sampling permits an estimated error. Sampling error is reduced by two factors in the sample design; Firstly, a large sample produces a smaller sampling error than does a small sample. Secondly, a homogeneous population produces samples with smaller sampling errors than does a heterogeneous population. If 99% of the population agree with a certain statement, it is extremely unlikely that any probability sample will greatly misrepresent the extent of agreement (Barbie, 1990). A stratified random sampling is a useful blend of randomization and categorization, thereby enabling both quantitative and qualitative research to be conducted (Cohen, et.al., 2000).

3.3.1.3 Higher education institution sample

Table 3.5: Sample size of the engineering undergraduate population

Research Instruments		Questionnaire Sample				Interview Sample			
Faculties		FKM	FKE	FKA	Total	FKM	FKE	FKA	Total
Government Higher Education	U1	30	30	30	90	1		1	2
	U2	30	30	30	90		1	1	2
Private Higher Education	U3	30	30	30	90	1	1		2
	U4	30	30	30	90		1	1	2
Sample Total					360				8

Note:
FKM: Faculty of Mechanical Engineering
FKE: Faculty of Electrical Engineering
FKA: Faculty of Civil Engineering

In this study, the engineering undergraduate sample will be chosen through a stratified random sampling procedure used to ensure that this research has proportional representation of population subgroups (from civil engineering, mechanical engineering and electrical engineering). The homogeneous categories of this sample are that they are engineering final year undergraduates in civil engineering, electrical engineering, and mechanical engineering which have been identified from the higher education institutions. This study requires 30 respondents of engineering undergraduates from each faculty identified for the questionnaires. Therefore, each university supplied 90 respondents and the total sample for the questionnaires from the private and government higher education institutions are 360 samples (refer to Table 3.5). The questionnaires will be passed to the class lecturer to manage the distribution and an arrangement made for the lecturer to collect the questionnaires at a later time of the day or after a week.

3.3.1.4 Employer sample

Table 3.6: Sample size of Industrial Training Employers

	Questionnaire	Interview
HRD Director/Manager	20	2

The other sample group (Table 3.6) was the 20 employers who provide the higher education institutions with industrial training/industrial placement. They were chosen with a similar method to the engineering undergraduates. The employer sample is represented by the Human Resource Manager/Director. Within the 20 employer samples, 2 will be selected for an interview session with their agreement indicated by them filling in the section for further interview in the covering letter of the questionnaire form (refer to appendix 3). This self administered and structured questionnaire will be delivered to their office and collected on the same day or by fax and email.

3.4 Research instrument

3.4.1 Overview

Figure 3.1: An overview of research design

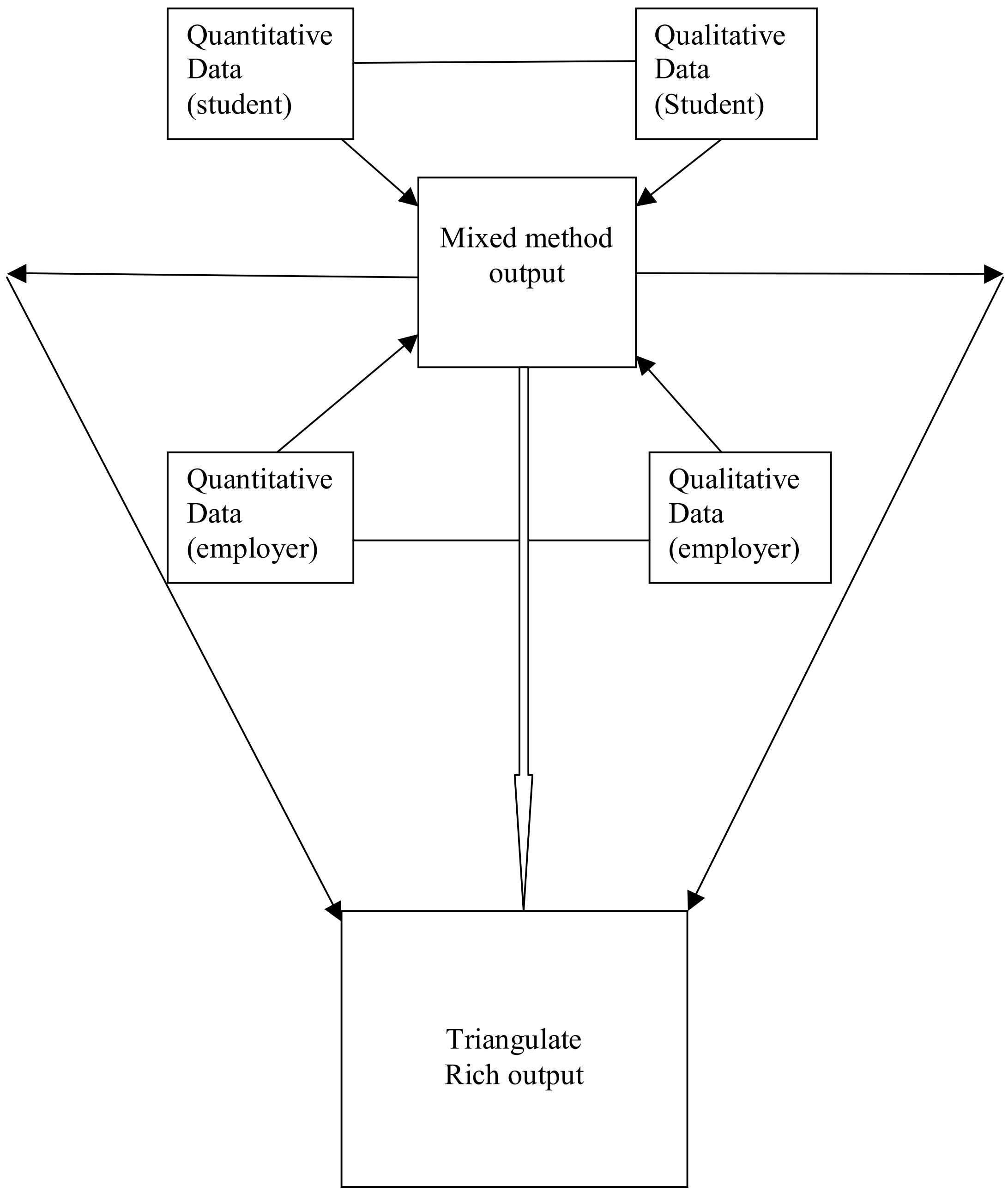


Figure 3.1 shows an overview of research design and the intended method and step that the researcher will use in this study. Survey questionnaire is use to get data from students and employer respondents. The researcher will analyse the survey data using SPSS Package 14. It will be discuss further in data analyse section and those data will be triangulate. Students and employers interview data also will be interpret and triangulate. Finally, both survey and interview data from students and employers will be triangulate for differences or significant of the study.

3.4.2 Survey design -why survey?

A survey is a method of collecting data from people about who they are (education, finances, and other area), how they think (motivations, beliefs,) and what they do (behaviour) (Barbie, 1990). Surveys usually take the form of a questionnaire that a person fills out alone or by interview. The result of the survey is a variable by case data matrix.

There are other ways of collecting data through the internet and other transactions, electronic and otherwise. These data are often used to construct a 'digital persona'-an electronic copy of a person's behaviour and preferences for marketing and other purposes. This is also a form of 'surveying', but masses of data do not necessarily guarantee meaningful results.

In this study, the survey is conducted to investigate whether the interpersonal and enterprise skills competencies contribute to unemployment amongst engineering graduates in Malaysia. The other reason is to investigate whether the engineering undergraduates had received a quality placement appropriate to their learning, knowledge and employability skills. The findings from the survey can contribute to the development and recommendations of solutions to enhance interpersonal and enterprise skills competencies amongst Malaysian engineering undergraduates.

3.4.3 Sequential mixed method

The study combining qualitative and quantitative approaches into the research methodology is also called a mixed-method design. This study has been designed as sequential (Creswell, 1995) which have two phases of study; the researcher first conducts a quantitative phase, and then a qualitative phase or vice-versa. The two phases are conducted separately.

3.4.4 Data collection strategies.

3.4.4.1 Questionnaire

Questionnaires are mainly paper-and-pencil methods of data collection. The questionnaire in this study is extracted from Course Experience Questionnaire (CEQ), used in Australia. Each year Australian universities undertake the Graduate Destination Survey (GDS), which incorporates the CEQ. The survey is coordinated by the Graduate Careers Council of Australia (GCCA). The CEQ is designed specifically as a performance indicator for monitoring the quality of teaching on a particular degree program. The CEQ was piloted on 3372 final-year undergraduate students at universities and colleges of advanced education in Australia, and the detailed results of this pilot study have been published (Ramsden, 1991b). The individual items from the CEQ were included in a student questionnaire employed in a national review of undergraduate accounting courses in Australia (Mathews et.al., 1990). The original CEQ was also used in a study of final year nursing students in Sydney (Trigwell & Prosser, 1991). It provides recent graduates with the opportunity to contribute to the Quality Assurance by offering structured commentary on their overall course experience. This evaluation operates, by relating questions to desired course outcomes. Therefore, according to the needs of this study, the questionnaire (appendix 2) has been modified to three scales as included in section A- Student Demography:

- Questionnaires- Structured (Quantitative)

  Section A consists of student demography (6 items)

  Section B consists of the development of interpersonal skills and enterprise skills in their programme (11 items)

  Section C consists of the development of interpersonal skills and enterprise skills in industrial training (11 items)

  Section D consists of the development of interpersonal skills and enterprise skills in university life and co-curriculum activities (11 items)

The questionnaire has a combination of open-ended and Likert-scale items to measure development of interpersonal skills and enterprise skills. Likert-scales ask the respondents to express their degree of agreement/disagreement with issues (or presence/absence of an attribute (Ary et al.,1996; Gall et.al., 1996) on response scales consisting of 6 options (1="strongly disagree", 2="disagree", 3="unsatisfied", 4="satisfied", 5="agree" or 6="strongly agree"). Refer to appendix 2 for the student's Generic Transfer Questionnaire (GTQ) questionnaire. The main objective of the

GTQ was to measure the development of interpersonal skills and enterprise skills amongst the engineering students throughout the programme, industrial training and university life and co-curriculum activity.

Another questionnaire was designed with the employers as the respondents. The questionnaire was designed to answer the research question which was to investigate whether the engineering undergraduates had received a quality placement (appropriate to their learning, knowledge and employability skills). Based on the literature about employers' needs and GTQ, the questionnaire has 3 sections as shown below (refer to appendix 3):

- Questionnaire-Structured (Quantitative)

  Section A- Employer Demography

  Section B- Generic Skills Scale

  Section C- Ranking of Generic skills importance

3.4.4.2 Interview

The interview is more frequently used as a method of data collection in qualitative research. The data collection strategy proposed in this study is a face-to face interview. The interview is a powerful method of data collection. It provides one-to-one interaction between the interviewer and the individuals they are studying (Krueger, 1988). It provides an opportunity to ask for clarification if an answer is vague or to provide a clarification if a question is not clear.

The purpose of the interview in this study 'is to find out what is in and on a person's mind…, to access the perspective of the person being interviewed…, to find out from them things that we cannot directly observe' (Patton, 1990). Open-ended interviews result in copious information about issues. Such information may lead to conceptualization of the issues in ways totally different from what had been anticipated. According to Eris, et., (2005), an interview was aimed at: enriching survey data by adding depth and texture to the questions asked, filling existing gaps in the survey by asking additional questions not initially addressed. As Charmaz explains:

> 'We start with the person's experiences and try to share his or her subjective view. Our task is objective in the sense that we try to describe it with depth and detail. In doing so, we try to represent the person's view fairly and to portray it as consistent with his or her meanings (1995: pg. 54)'.

In this study, there are two sets of interview questions. One set was constructed for the engineering undergraduate and the other set was constructed for the employer who is providing them with the industrial training. The in-depth interview and open-ended questions are specially constructed for the purpose of this study to measure the 2 main variables, which is development of interpersonal skill, and enterprise skills competency amongst undergraduate engineers. References for the in-depth interview questions for both the student and employer respondents are detailed in appendix 4a and 5 respectively.

3.5 Data analysis/interpretation

3.5.1 Quantitative data analysis

Survey data collected by the questionnaires can be keyed into the latest version of SPSS (Statistical Package for Social Science) and analyzed through Cronbach Alpha Analysis, Mean and Exploratory Factor Analysis (EFA) to measure the validity of the tool construct. Cronbach's alpha measures how well a set of items (or variables) measures a single unidimensional latent construct. When data have a multidimensional structure, Cronbach's alpha will usually be low. Technically speaking, Cronbach's alpha is not a statistical test - it is a coefficient of reliability (or consistency). Then, the interview data are interpreted. By applying the survey technique, other variables such as attitudes and behaviour patterns, and other aspects of the respondents emotions towards the interpersonal and enterprise skills can be examined.

3.5.1.1 Factor Analysis

Factor analysis is a statistical technique that can be applied to a single set of variables when the researcher is interested in discovering which variables in the set form coherent subsets that are relatively independent of one another. Variables that are correlated with one another but largely independent of other subsets of variables are combined into factors. Factors are thought to reflect underlying processes that have created the correlations amongst variables. The researcher explores the employability competency of engineering graduates towards interpersonal skills and enterprise skills. Measurement of a large sample of engineering graduates on demographic characteristics, programme evaluation, industrial training evaluation and university life and co-curriculum activity evaluation is proposed.

Factor analysis is the orderly simplification of a large number of intercorrelated measures to a few representative constructs or factors. It allows the researcher to "reduce" the mass of numbers to a few representative factors, which can then be used for subsequent analysis. There are three basic steps to factor analysis:

i. computation of the correlation matrix for all variables.

ii. Extraction of initial factors.

iii. Rotation of the extracted factors to a terminal solution.

Therefore, it is proposed to run the Exploratory Factor Analysis (EFA) to measure the GTQ construct. High scores indicate a positive and good construct (Guadagnoli and Velicer, 1988).

3.5.1.1.1 Computation of the correlation matrix

Factor analysis is based on correlations between measured variables. A correlation matrix containing the intercorrelation coefficients for the variables must be computed. The variables must be measured at least at the ordinal level, although two-category nominal variables (coded 1-2) can be used.

3.5.1.1.2 Extraction of Initial Factors

At this phase, the number of common factors needed to adequately describe the data is determined. To do this, the researcher must decide on (1) the method of extraction, and (2) the number of factors selected to represent the underlying structure of the data.

3.5.1.1.3 Method of extraction

There are two basic methods for obtaining factor solutions. They are principal component analysis and common factor analysis (Note: SPSS provides six methods of extraction under the common factor analysis model; these are: Principal-axis factoring, unweighted least-squares, generalized least-squares, maximum-likelihood, alpha factoring, and image factoring). For the purpose of this research, which is to "reduce data" to obtain the minimum number of factors needed to represent the original set of data. The principal component analysis is appropriate. The researcher works from the premise that the factors extracted need not have any theoretical validity. Conversely, when the primary objective is to identify theoretically meaningful underlying dimensions, the common Factor Analysis method is the appropriate model. Given the more restrictive assumptions underlying common factor analysis, the principal components method has attracted more widespread use (Ho,2006).

3.5.1.1.4 Determining the number of factors to be extracted

There are two conventional criteria for the determining the number of initial unrotated factors to be extracted. These are the Eigenvalues criterion and the Scree Test criterion.

3.5.1.1.4a Eigenvalues

Only factors with eigenvalues of 1 or greater are considered to be significant; all factors with the eigenvalues less than 1 are disregarded. An eigenvalue is a ratio between the common (shared) variance and the specific (unique) variance explained by a specific factor extracted. The rationale for using the eigenvalue criterion is that the amount of common variance explained by an extracted factor should be at least equal to the variance explained by a single variable (unique variance) if that factor is to be retained for interpretation. An eigenvalue greater than 1 indicates that more common variance than unique variance is explained by that factor.

3.5.1.1.4b Scree Test

This test is used to identify the optimum number of factors that can be extracted before the amount of unique variance begins to dominate the common variance structure (Hair, Anderson, Tatham, & Black, 1995). The scree test is derived by plotting the eigenvalues (on the Y axis) against the number of factors in their order of extraction (on the X axis). The initial factors are large (with high eigenvalues), followed by smaller ones. Graphically, the plot will show a steep slope between the large factors and the gradual trailing off of the rest of the factors. The point at which the curve first begins to straighten out is considered to indicate the maximum number of factors to extract. That is, those factors above this point of inflection are deemed meaningful, and those below are not. As a general rule, the scree test results in at least one and sometimes two or three more factors being considered significant than does the eigenvalue criterion (Cattel, 1966).

3.5.1.1.5 Rotation of extracted factors

Factors produced in the initial extraction phase are often difficult to interpret. This is because, the procedure in this phase ignores the possibility that variables identified to load on or represent factors may already have high loadings (correlations) with previous factors extracted. This may result in significant cross-loadings in which many factors are correlated with many variables. This makes interpretation of each factor difficult, because different factors are represented by the same variables. The rotation phase serves to "sharpen" the factors by identifying those variables that load on one factor and not on another. The ultimate effect of the rotation phase is to achieve a simpler, theoretically more meaningful factor pattern.

3.5.1.1.6 Rotation methods

There are two main classes of factor rotation method: Orthogonal and Oblique. Orthogonal rotation assumes that the factors are independent and the rotation process maintains the reference axes of the factors at 90 degrees. Oblique rotation allows for correlated factors instead of maintaining independence between the rotated factors. The oblique rotation process does not require that the reference axes be maintained at 90 degrees. Of the two rotation methods, oblique rotation is more flexible because the factor axes need not be orthogonal. Moreover, at the theoretical level, it is more realistic to assume that influences in nature are correlated. By allowing for correlated factors, oblique rotation often represents the clustering of variables more accurately.

There are three major methods of orthogonal rotation: varimax, quartimax and equimax. Of the three approaches, varimax is widely used as it seems to give the clearest separation of factors. It does this by producing the maximum possible simplification of the columns (factors) within the factor matrix. The goal of varimax rotation is to simplify factors by maximizing the variance of the loadings within factors, across variables. The spread in loadings is maximized – loadings that are high after extraction become higher after rotation and loadings that are low become lower. Interpreting a factor is easier because it is obvious which variables correlate with it. Varimax also tends to reapportion variance among factors so that they become relatively equal in importance; variance is taken from the first factors extracted and distributed among the later ones. In contrast, both quartimax and equimax approaches have not proven very successful in producing simpler structures, and have not gained widespread acceptance.

3.5.1.1.7 Estimates of communalities

Communality values are used instead of one to remove the unique and error variance of each observed variable; only the variance shares with the factors is used in the solution. Communality values estimates are adjusted by iterative procedures to fit the observed correlation matrix with the smallest number of factors. Iteration is stopped when successive communality estimates are very similar (Tabachnick, 1994).

3.5.1.1.7.1 Number of factor analysis runs

The use of factor analysis by the researcher (either for the purpose of data reduction or to identify theoretically meaningful dimensions), requires a minimum of two runs. In the first run, the researcher allows factor analysis to extract factors for rotation. All factors with eigenvalues of 1 or greater will be subjected to varimax rotation by default within SPSS. However, even after rotation, not all extracted rotated factors will be meaningful. For example, some small factors may be represented by very few items, and there may still be significant cross-loading of items across several factors. At this stage, the researcher will decide which factors are substantively meaningful (either theoretically or intuitively) and retain only these for further rotation. It is not uncommon for a data set to be subjected to a series of factor analysis and rotation before the obtained factors can be considered “clean” and interpretable.

3.5.1.1.8 Interpreting factors

In interpreting factors, the size of the factor loadings (correlation coefficients between the variables and the factors they represent) will help in the interpretation. As a general rule, variables with large loadings indicate that they are representative of the factor, while small loadings suggest that they are not. In deciding what is large or small, a rule of thumb suggests that factor loadings greater than $\pm$ 0.45 score is that if the value is squared, the squared value represents the amount of the variable's total variance accounted for by the factor (Tabachnick, 2001). Therefore, a factor loading of 0.45 denotes that the variable's total variance is accounted for by the factor. The grouping of variables with high factor loadings should suggest what the underlying dimension is for that factor.

3.5.2 Qualitative interpretation

Interviews and open ended questionnaires, as well as documents of all kinds of data sources are used for qualitative studies. Qualitative method can utilize quantitative data (Glazer & Strauss, 1967, 185-220). As Glazer and Strauss (1967) assert:

> 'We have suggested that the criteria of judgment be based instead on the detailed elements of the actual strategies used for collecting, coding, analyzing and presenting data when generating theory and on the way in which people read the theory. (p.224)'

Therefore, in interpreting the open ended data, the researcher converts the data into several related categorical themes under study and interprets it. As for the interview data, the researcher transfers them to categorical themes and utilizes grounded theory (Strauss, 1987). The researcher is interested in patterns of action and interaction between and among various types of social units. As supported by

Denzin & Lincoln, (1994) firstly, theories are always traceable to the data that gave rise to them, within the interactive context of data collecting and data analyzing, in which the analyst is also a crucially significant interactant. Secondly, grounded theories are very "fluid". This is because they embrace the interaction of multiple actors and they also emphasize temporality and process. They call for exploration of each new situation to see if they fit, how they might fit and how they might not fit.

Finally, the researcher utilizes a triangulation method for the robustness of the study. The triangulation method looks into the correlation or difference amongst samples studied.

3.5.2.1 Triangulation

Originally used in social sciences and psychology (Smith, 1975) several management studies have used triangulation to resolve difficulties in interpretation and theory building. Since the early efforts of Denzin (1970), triangulation studies have gone beyond the initial focus on eliminating weaknesses in any one method. There are five basic types of triangulation. First, data triangulation strengthens research findings by using multiple ways to collect and analyze data involving time, space and persons. Second, investigator triangulation consists of the use of multiple, rather than single observers. Third, multiple triangulation refers to the situation where the researcher combines in one investigation multiple observers, theoretical perspectives, sources of data and methodologies. Fourth, theory triangulation consists of using more than one theoretical scheme in the interpretation of the phenomenon. Fifth, methodological triangulation involves using more than one quantitative or qualitative data sources or methods in a single of research (Jick, 1979).

There are three rationales frequently given for using methodological triangulation. The first is completeness, which recognizes that following McGrath (1982), any single research method chosen will have inherent flaws, and the choice of that method will limit the conclusions that can be drawn. It is therefore essential to obtain corroborating evidence from using a variety of methods that can be classified generally as either qualitative or quantitative. Quantitative and qualitative methods complement each other, providing richness or detail that would be unavailable from one method alone. The second rationale is contingency, which is driven by the need for insights into how and why a particular strategy is chosen. For example, qualitative research is often used when a phenomenon is very complex or poorly understood. Such contingent choices of methodology are often dictated by newness i.e. discovery of environmental attributes that give rise to the phenomenon are necessary before we can quantify and measure such attributes. Interviews with managers, critical incident analysis, document reviews and interpretative modes of assessment can orient researchers to the nuances of how and why, for example, different strategies and tactics are deployed. The results may suggest hypotheses to be tested by quantitative methods. Qualitative investigation can also help organize quantitative data that have already been gathered or suggest new ways of approaching the phenomenon. The third rationale for triangulation is confirmation. Triangulation should improve the ability of researchers to draw conclusions from their studies and might result in a more robust and generalizable set of findings (Knafl and Breitmayer, 1989). Traditional criteria like reliability and validity are replaced by the level of symmetry between alternative methods used. By combining multiple data sources, alternate observers, distinctively different theories, alternate methods and varying empirics, the researcher hopes to overcome the intrinsic biases arising from single method, single-observer and single-theory studies.

3.6 Validity and reliability.

3.6.1 Sample of items and measurement instrument (content validity)

The objective of item creation is to ensure content validity. Content validity is the representativeness or sampling adequacy of the construct domain (Carmines, 1979). To generate a representative sample of items and achieve content validity, a variety of procedures need to be employed in this study.

The first procedure is a content analysis of the literature. The selected literature spans both academic and professional journals and books in Engineering Education, as well as other addressed disciplines. The literature is pre-screened to determine the pieces that directly addressed the topic of generic skills and engineers. Articles and books are chosen for review if the terms “interpersonal skills” or “enterprise skills” or “employability” or “generic skills” are in the title or key word list. The rationale for this search standard was based on the fact that, because generic skills are ill-defined, authors who label their publications with the term are contributing to the explication of the Generic Transfer Questionnaire (GTQ) construct. The time period covered by the literature is from 1956 to the present.

The questionnaire was then pre-tested using five lecturers. They are asked to note any activities that should be added, deleted, or modified. They also commented on each item's meaningfulness and readability. Refinements to the instrument are made based on their suggestions.

A pilot test of the instrument was then undertaken with thirty engineering undergraduates from one of the Malaysian Universities. The participating respondents need to show that they understand all the terms and content of the questionnaire construct.

Validity is important to effective research. Validity is based on the view that it is essentially a demonstration that a particular instrument in fact measures what it purports to measure (Cohen et.al., 2000). In qualitative data validity might be addressed through the honesty, depth, richness and scope of the data achieved, the participants approached, the extent of the triangulation and the objectivity of the researcher. In quantitative data validity might be improved through careful sampling, appropriate instrumentation and appropriate statistical treatments of the data. Quantitative research possesses a measure of standard error which is inbuilt and which has to be acknowledged. In qualitative data the subjectivity of respondents, their opinions, attitudes and perspectives together contribute to a degree of bias. Validity, then, should be seen as a matter of degree rather than as an absolute state (Gronlund, 1981). Therefore, this study tries to minimize invalidity and maximize validity.

In this study validity is enhanced by interviewing techniques that build rapport, trust and openness and which give informants scope to express the way they see things. Questions are drawn from the literature and from pilot work with respondents. A set of questions that fully covers the issues arising from the research question ensures that the key aspects are not ignored. As for the quantitative data validity measurement, the researcher employs factor analysis measurement.

3.6.2 Instrument assessment (reliability and validity)

Data collected from the survey is used to evaluate the validity and reliability of the measurement instrument. Construct validity is concerned with whether the measure reflects true dimensions of the concept or is influenced by the methodology (Cronbach, 1971). In order to demonstrate construct validity, the instrument should reflect a reasonable operational definition of the concept it purports to measure (Kerlinger, 1973). Stone (1978) noted that examining the components that make up the overall measure is a legitimate method for assessing construct validity. Likewise, Allen and Yen (1979) suggested that the appearance of logical factors is one indication of construct validity for a measure. Straub (1989) asserted that factorial validity was a confirmation that the measure exhibited latent constructs. Spector (1992) observed that factor analysis is a useful approach in the process of scale validation. Factor analysis has been utilized in several studies to examine this aspect of construct validity.

Reliability is a matter of whether a particular technique, applied repeatedly to the same object, would yield the same result each time (Barbie, 1990) Reliability is mainly about reducing interviewer bias (Arksey et. al, 1999).

In this study, reliability is controlled through highly structured questions and interviews, with the same format and sequence of words and questions for each respondent (Silverman, 1993). Oppenheim (1992: 241-9) supported that wording is a particularly important factor in attitudinal questions rather that factual questions. He suggests that changes in wording, context and emphasis undermine reliability, because it ceases to be the same question for each respondent.

3.7. Pilot report.

The pilot survey is important to the researcher. This part contributed as guidance for the conduct of further research in this study. It shows which part is important and has to remain, thus it also guided the researcher to improve or eliminate certain parts which were not in line with the objectives and aims of this study.

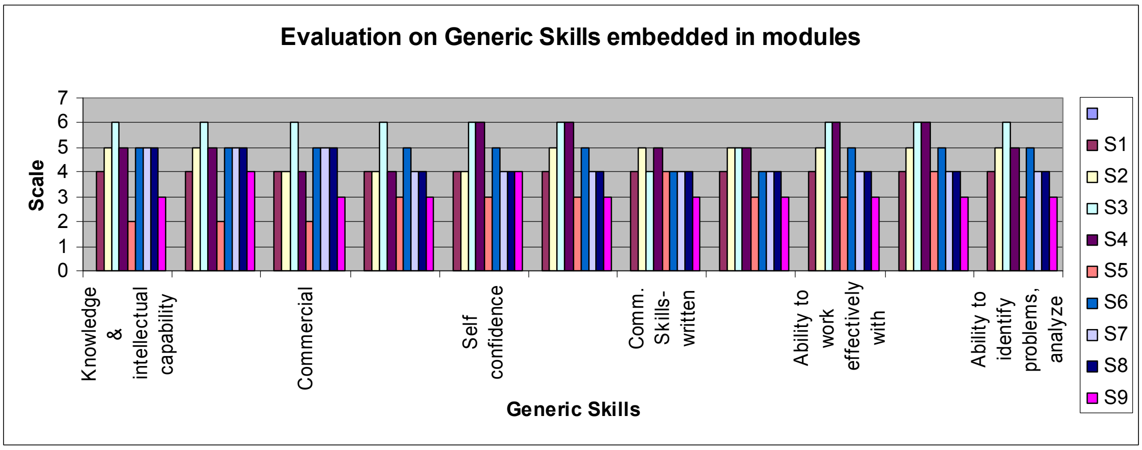
3.7.1 Section A- student demography.

There are 22.22% males and 77.77% females. Most of the engineering undergraduates are Malaysian and their race is Malay and Bidayoh. This is expected because Malaysia is a multi-racial country. In terms of religion, 77.77% are Muslims, 11.11% are Christians and 11.11% undetermined. 55.56% of the respondents have working experience less than one year, while the rest have no working experience. 44.44% of the respondents have experience in semi-skilled sectors and 11.11% have experience in a manual working environment. Therefore, there is a mixed situation in the experience sector. It is an opportunity for the non- work experienced students because the experienced student can offer help. 33.3% of the respondent are sponsored by JPA (Public Service Department) and 55.56% funded by a loan from PTPTN (National Fund of Higher Education). Only 11.11% respondents were funded by their parents. Here it shows that not every parent is wealthy enough to support their children's education. Most of them depend on financial bodies or institutions to help their children's education. In this case, government bodies play an important role in helping fund higher education.

3.7.2 Section B – evaluation on generic skills (GS) embedded in modules.

In section B, 78% of respondents gave positive feedback on the evaluation on generic skills embedded in the modules. Most of them chose scale of 4, 5 and 6 which represents the highest scale levels. Only 22% have a negative impression of the evaluation on the generic skills embedded in modules. Most of them chose scale levels of 2, 3 and 4 (refer to figure 3.2). The difference can be seen clearly amongst the samples in the generic skills categories. Therefore, there are a few indications that the generic skills embedded in modules do not match their expectations.

Figure 3.2: Evaluation on generic skills embedded in modules



In section B, 88.9% say that the programme and modules meet their expectations as to the job market. Only 11.12% said that not much experience was exposed to them. Therefore, this gives an indication that the student expectation is low, or the industrial training has not given an appropriate level of experience or there is a mismatch somewhere in the HEI transferable skills administration and maybe because of economic factors. Subsequently; this feedback will be supported with an interview survey amongst the students and distribution of questionnaires amongst the employers to study the issues in depth. Therefore, the data will give a clearer view on the above matter.

44.44% mentioned that presentation skills and industrial training, respectively are the most valuable sessions for employability throughout their program. Only 11.12% leave the question unanswered or blank and the others say that communication skills give them a way of how to express ideas.

Referring to the least valuable session for employability skills throughout their program, 22.2% say tutorial sessions, 33.3% said Tamadun Islam (Islamic Civilization) and Tamadun Asia (Asia and Civilization), 33.3% leave the question unanswered and 11.12% said fluid mechanics because it has a lot of research and development. For the other comments only one respondent said that most subjects are relevant to industry. Others just leave the question blank. From the feedback in this section, there is a positive impact for either the educators to improve their way of teaching or to look to the relationship between the modules and the employability objectives and consider an improvement to the modules or curriculum.

3.7.3 Section C- evaluation on placement/industrial training.

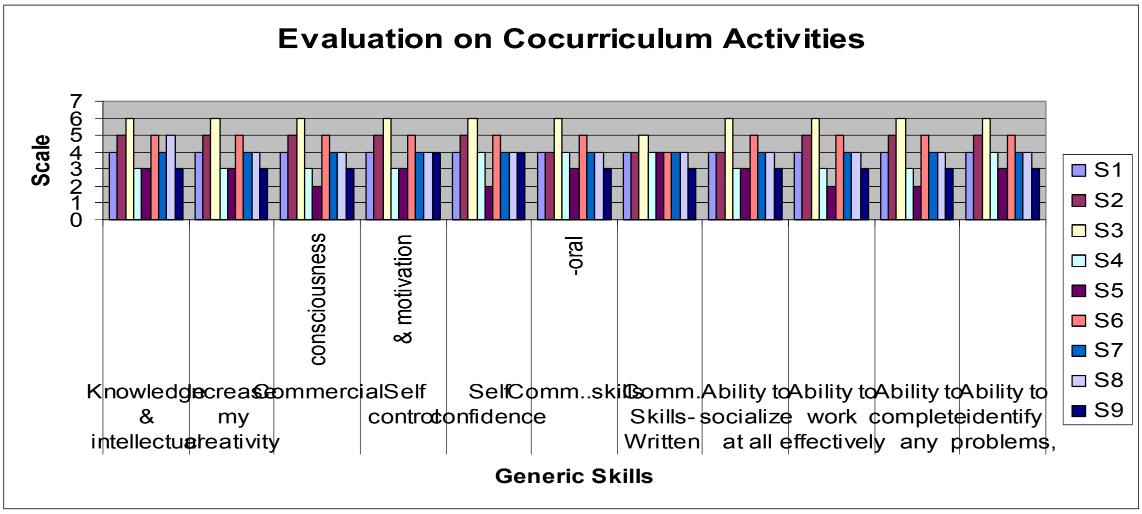
66.7% of students said that the task during their training industrial training was appropriate to their academic requirement, where as 33.3% just leave the question unanswered. 88.9% said the task has increased their interpersonal skills and enterprise skills where as only 11.12% leave the question blank, and 66.7% said the time given for the industrial training is enough to build interpersonal skills and enterprise skills where as 33.3% said no because the time is too short and not enough to build confidence and 11.1% leave the question blank.

As for the opinion to the best way to transfer interpersonal skills and enterprise skills by industries, 22.2 % said by presentation skills, 11.1% said hands-on experience and group projects, 22.2% said communication and, 11.1% said task run by contacting other employers. 11.1% said that they have to work hard to be known by supervisors through their achievement and the rest leave the question blank. Therefore, this shows most undergraduates believe that communication, team work and to maintain a good relationship with employers are important skills in employability. In terms of a quality industrial training, 22.2% said well training and good exposure to industrial job training is considered as quality and 11.1% said through problem solving. 33.3% said industry should give them space to relate the knowledge they learn in class during industrial training, so that they can increase their knowledge on the matter and learn new things in an industrial environment. 22.2% leave the question blank. This shows that respondents are willing to continue their industrial training for a longer period so that their basic knowledge and employability skills can be expanded in the workplace environment.

3.7.4 Section D- Evaluation on co-curriculum activities.

In section D, 66.6% gave positive feedback where university co -curriculum activities had increased their generic skills level. Most of them rated 4, 5 and 6 from the scale given, while 33.3% has negative feedback on the university co-curriculum activities. Most only rated 2, 3 and 4 from the scale given. With reference to figure 3.3, the difference between the generic skills categories can be seen clearly in the sample. This feedback gave the researcher the assumption that any activity at university either good or not is dependent on the individual. If the individual does not feel like contributing and socializing, then they cannot make any difference in their life. But if the students join all the co-curriculum activities that can benefit their life additional skills such as leadership building, teamwork, communication skills, problem solving, decision making and lots more can improve their future career and personal development.

Figure 3.3: Evaluation on Co-curriculum Activities



In part two of section D, 44.4% said university life has met their expectations as to job market i.e. ‘yes, I’ve learned many things that can make me a very good engineer’. 44.4% said that the university life does not met their expectation i.e: ‘not enough facility, and do not have opportunity to learn other languages for international market’.

Reaction to the question regarding the most valuable session throughout their university life that they considered will help them to be employed, 33.3% mentioned their industrial training, 11.12% mentioning that they learned how to socialize and share ideas, make presentations, lab session, they also learned about leadership through student union committees, and their performance result monitored throughout the study assessment (CGPA). Only 11.12% either leave the question blank or say there were no valuable sessions that can assist them to be employed. From the above response, the researcher can say that their expectation of employability is shallow and according to the literature on employer needs, it is unlikely that employers would employ them. They should know that there are many engineering graduates with good and relevant results for certain jobs, and that makes them more employable.

77.8% have no comments on the least valuable session for employability skills throughout their university life and leave it blank, while 11.12% mentioned subjects like Islamic Civilization and Asian Civilization modules and the others said co-curriculum only improves social skills.

Finally, further comments or suggestions for a good quality generic skills transfer throughout the university life, some mentioned student exchanges with other international universities, to organize a lot of related conferences, use more funding to encourage more student involvement in co-curricular activities and 66.6% did not answer the question by leaving it blank.

3.7.5 Discussion

In section A, dealing with the demography issue, the researcher finds that question number 2 will contribute to gender comparison where it will benefit the study in future. Question number 3, deals with nationality, and question number 4, addresses the issue of race. Some of the higher institutions especially the private institutions have an international enrolment, and therefore will show responses from international students who study in Malaysia. The researcher feels that question 4 does not answer the study objectives. Therefore, question 4 will be excluded. Question 5, regarding religion will also be omitted because it does not fit with the objectives of the study. The researcher felt that for question number 6 on working experience, is misunderstood by the student and will add 'exclude industrial training' and question 7 to be changed to ' what type of work they have been doing' and include a blank space for a response. Question 8 on financial issues will be taken out because most of the respondents have government study loans and it does not answer the study objectives. If there is a significant different in self sponsored and government sponsored, maybe this study can look at other perspective that can be relate to this study. Therefore, the researcher does not include question 8. Sections B, C and D will remain as they are because the students had answered and understood the terms used in the questionnaires.

3.8 Summary.

This chapter has established that there are two groups of respondents i.e. students and employers. Data will be gained through questionnaires specifically designed for both groups and interviews will be held to add for the robustness of the study.

This chapter has also discussed how the researcher will use Exploratory Factor Analysis (EFA) to measure the questionnaire construct content validity and Cronbach Alpha as a reliability measure in the quantitative analysis. This instrument and analysis can contribute to determine if the method and instrument chosen are appropriate for this study.

The researcher has discussed how grounded theory and triangulation will be used to interpret the qualitative data. Both data from the students and the employers quantitative and qualitative findings will be triangulated. This is to investigate the response patterns and correlation of both methods chosen.

The researcher believes the methods used in this study will give rigorous feedback on the causes of unemployment whether by lack of interpersonal and enterprise skills or the employer needs were not met by Malaysian HEI and to create awareness about the highlighted matters. The next chapter will look into the field work outcome from the quantitative methods.

CHAPTER 4

QUANTITATIVE ANALYSIS: MEAN, EXPLORATORY FACTOR ANALYSIS AND CRONBACH ALPHA ANALYSIS

4.0 Overview.

The analysis presented in this chapter tests the Generic Transfer Questionnaire (GTQ). The GTQ will measure whether through the programme, industrial training, co-curriculum activity and university life has increased the engineering students' interpersonal skills and enterprise skills. Exploratory factor analysis was used to test the validity and reliability of the proposed methodology and measurement tool.

This chapter intended to measure the design tools in terms of appropriateness for interpersonal and enterprise skills. The detailed analysis for those respondents has been done. High scores (Tabachick, 2001) amongst factors determine the validity and reliability of the tool designed.

4.1 Engineering undergraduate respondents.

The population under study has been chosen through stratified random sampling from four universities in Malaysia; two government public universities and two private universities. Stratified random sampling is a method for obtaining a sample with a greater degree of representativeness. The homogeneous categories of this sample are; they are final year engineering undergraduates (civil engineering, electrical engineering, and mechanical engineering) who have been identified from the higher education institutions mentioned above and a gender distribution. 90

respondents were chosen from each university. Therefore, a total of 360 respondents were required for the study. The reason for the large and homogeneous sample is the error it produces is small (Tabachnick, 2001: p.59). The questionnaires were passed to the class lecturer to manage the distribution. An arrangement has been made with the lecturer to collect the questionnaire at a later time of the day or one week after. There was also help from the faculties Assistant Registrar or representative in the questionnaire distribution. The students identified as a part of sample, came to the faculty registrar's office voluntarily to answer the questionnaire. This study received responses from 269 undergraduate engineers. The survey questionnaire took approximately 10 to 15 minutes to complete.

4.2 Employer respondents.

The objective to involve employers in this study was to explore the employers' feedback towards the industrial training delivered to the engineering students. The researcher would like to explore whether the employers have delivered a quality training experience to the trainees during their industrial training which takes around 12 weeks or 3 months in the employers' premises.

The employer population in this study was obtained through probability random sampling. This method was chosen by the researcher to be able to make generalizations, because it seeks representativeness of a wider population. A probability sampling has less risk of bias. The researcher with the help from the universities industrial training or placement officer was given a list of employer companies, contact numbers and emails which provide industrial training to engineering students. Twenty employers were identified for the questionnaire survey. Sixteen employers responded and returned the questionnaires. The researcher had to make reminder calls, emails or in some cases had to fax again the GTQ employers' questionnaire to the employers. Responses from employers are difficult as they are tied up with their day to day production or business operation. Therefore, the researcher had to utilize the 16 employers' responses for the analysis.

4.3 Research design

4.3.1 Questionnaires

The tool designed in this study was the questionnaire called the Generic Transfer Questionnaire (GTQ). As described in section 3.4.3.1, GTQ questionnaires are mainly paper-and-pencil methods of data collection. The researcher has constructed a Generic Transfer Questionnaire (GTQ) developed from Course Experience Questionnaire (CEQ) (Ramsden, 1991, Wilson, Lizzio and Ramsden, 1997). The GTQ framework was combined with the generic skills criteria for the workplace study (Harvey, 2001) to suit the research purpose. This tool is formulated to evaluate the engineering respondents' generic skills developed and transferred throughout their courses, industrial training and university life and co-curriculum activities.

The GTQ set for the engineering undergraduate respondents is divided into four sections; section A is the respondent's demography, section B is the evaluation of interpersonal and enterprise skills embedded in the programme module, section C is the evaluation of interpersonal and enterprise skills in industrial training and section D is the evaluation of interpersonal and enterprise skills in university life and co-curriculum activity. At the end of sections B, C and D there was an open ended question. It deals with issues of the most valuable session, the least valuable session and comments. The open ended data will be discussed in Chapter 5.

The employer's set of questions have 3 sections; section A is the employer's demography, section B is the industrial training evaluation and section C is the ranking of importance of generic skills. At the end of section A, there were 3 open ended questions regarding the most valuable session of the industrial training, the least valuable session and comments. The open-ended data will be discussed in Chapter 5.

The second tool used in this study was an in depth interview with both the employers and engineering undergraduate respondents. This method also will be discussed in Chapter 5.

4.4 Ethics- codes and consent

One significant element in the codes is the concept of "informed consent", by which the subjects of research have the right to be informed that they are being researched and also about the nature of the research (Denzin & Lincoln, 1994). According to Weppner (1977) "that the potential research subject understand the intention of the research and sign an 'informed consent' form, which incidentally must specify that the subject may withdraw from the research project at any time". Therefore, the researcher attached a letter of consent to the respondents on the first page of the GTQ survey questionnaire. In return, the researcher would not reveal any names of institutions, individuals or companies that participated in the study. All the respondents' names, institutions and companies involved in this study have been changed to a code that is only known to the researcher and would not reveal the identity of the party involved in this study.

4.5 Descriptive analysis

360 questionnaires were distributed, and 269 questionnaires returned to the researcher. That means there was a response rate of 74.72% from the engineering undergraduates. According to Mangione (1995) response rates in the 70% to 80% range are viewed as very good. Participants gave their ratings on a six-point Likert scale ranging from 1 who strongly disagree to scale 6 who strongly agree, with the frequency mean being mostly 4.5 and towards 5. The standard deviation scores of programme evaluation, industrial training and university life and co-curriculum evaluation are in between 0.87 to 1.0. Therefore, according to Tabachnick, (2001) the high scores are indicators of a good result.

The researcher also has run a respondent mean comparison between faculties which are the electrical engineering faculty, civil engineering faculty and mechanical engineering faculty to look at whether the results are significant or not. After running the test, it was found that the result was not significant. The result does not show much difference in mean only 0.1 to 0.5 (Appendix 1). Therefore, in this study the researcher assumes that the engineering undergraduates in the study are as a whole not affected by the type of faculty.

4.5.1 Non-response analysis.

Non-response refers in many sources to failure to obtain responses or measurements on some elements selected and designated for the sample (Kish, 1965). When response rates are high, there is only small potential for error due to non-response. When response rates are low, there is a great potential for significant error and critics of the survey results have a strong basis on which to say the data are not credible (Fowler, 2002). This study of 25.28% of non-response rates compared to the response rate of 74.72% indicates a good result (Mangione, 1995) from a data collection perspective.

4.5.1.1 What causes non-response samples?

The researcher's reasons for a non-response sample in this study are down to the method of questionnaire distribution. It was not possible for the researcher to be present at all the specific locations because of having to arrange data collection at another site. The help of the Assistant Faculty Registrar was used to collect samples through their office. Only samples that were issued by the office would have had the opportunity to answer. Therefore, if the researcher had changed the method of questionnaire distribution the non-response rate would be different.

Data was collected during term time, therefore, most of the students were occupied with classes and the registry office closes at five, limiting student opportunity to complete the questionnaire.

According to Kish (1965, p.533) the non response rate caused by refusals depends on several factors. Firstly, the nature of respondents may differ and their disposition may vary from cheerfully cooperative to hostile. Differences may occur between cultures, social classes and demographic categories. Since most refusals can be considered permanent, a general term for this category is unobtainable, denoting a denial rather than a deferment of response, whether by interview, telephone, mail or distributed questionnaire or instrumented observation. Repeating the attempt would not lead to success.

4.5.1.2 Non-response elimination

According to Tabachnik (2001:p.59), if there are only a few cases of missing data and they appear to be a random sub sample of a whole sample, deletion is a good alternative. According to Guadagnoli and Velicer (1988) about 150 cases should be sufficient to run an Exploratory Factor Analysis (EFA). The outcome of SPSS analysis demonstrates that a high score in EFA contributes to validity and reliability of data. This study also utilizes mixed method to ensure stronger data analysis. Complimentary of qualitative interpretation, combination of triangulation techniques and the use of grounded theory will fill the gap of non-response samples. Therefore, based on this argument, the researcher eliminated the non-response sample.

4.6 Analysis of the engineering undergraduate characteristics

4.6.1 Age

Table 4.1: Age range of undergraduate engineering respondents

Age range	Frequency	Percentage
20-25 years	255	94.8
26-30 years	12	4.5
31-35 years	1	0.4
Over 35 years	1	0.4
Total	269	100

The majority (94.8%) of respondents are in the age range of 20-25 years as illustrated in Table 4.1. 4.5% of the respondents are in the range of 26 – 30 years and only 0.4 % is more than 30 and 35 years. This shows that most students are young. Only two respondents are above 30 years old. They may have been working previously and decided to upgrade their knowledge.

4.6.2 Gender

Table 4.2: Gender of undergraduate engineering respondents

Gender	Frequency	Percentage
Male	154	57.2
Female	115	42.8
Total	269	100

Table 4.2 shows that out of 269 respondents, 154 or 57.2% are male. This illustrates that there is only a small difference in the number of male and female

engineering undergraduates. In the United Kingdom the distribution is significantly different.

4.6.3 Registered programme

Table 4.3: Registered programme of engineering undergraduate

Program	Frequency	Percentage
Mechanical	69	25.7
Civil	77	28.6
Electrical	123	45.7
Total	269	100

Table 4.3 demonstrates the engineering undergraduates by registered programme. The highest proportion by registered programme is in electrical engineering consisting of 45.7%. The civil engineering degree consists of 28.6%. The mechanical engineering degree consists of 25.7%. Therefore, most respondents are in the electrical engineering programme.

4.6.4 Nationality

Table 4.4: Range of nationality of engineering undergraduates

Item	Frequency	Percentage
Malaysian	263	97.8
South African	2	0.7
Iranian	3	1.1
American	1	0.4
Total	269	100

Table 4.4 shows most (97.8%) of the respondents were of Malaysian nationality. Iranian, South African and American consists of 1.1%, 0.7% and 0.4%, respectively.

4.6.5 Work experience

Table 4.5: Work experience of engineering undergraduates

Item	Frequency	Percentage
No experience	137	50.9
Below 1 year	121	45
2 years	9	3.3
Above 4 years	2	0.7
Total	269	100

Table 4.5 above shows the working experience of engineering undergraduates. Most (50.9%) of the students have no working experience, while 45% have one year or less of working experience. 3.3% have 2 years of working experience and only 0.7% has more than 4 years.

4.6.6 Type of work experience

Table 4.6: Type of work experience of engineering undergraduates

Item	Frequency	Percentage
No work experience	133	49.4
Sales/marketing	43	16
Administration	43	16
Technician	18	6.7
Others	32	11.9
Total	269	100

Table 4.6 above illustrates the type of work engineering undergraduates have experienced. 49.4% have no working experience. Sales or marketing and administration both have 16%. 6.7% have worked as technician and 11.9% other work experiences.

4.7 Frequency analysis

Respondents are asked to express their degree of agreement or disagreement with issues in GTQ questionnaires response scales consisting of 6 Likert scale options (1=strongly disagree, 2=disagree,3=unsatisfied, 4=satisfied, 5=agree, 6=strongly agree)(Refer Appendix 2).

4.7.1. Generic Transfer Questionnaire (GTQ) on programme evaluation.

Table 4.7: Frequency and percentage that the programme has developed respondents knowledge and intellectual capability

	Frequency	Percentage	Cumulative Percentage
Strongly disagree	2	.7	.7
Disagree	2	.7	1.5
Unsatisfied	30	11.2	12.6
Satisfied	70	26	38.7
Agree	111	41.3	79.9
Strongly agree	54	20.1	100
Total	269	100	

Table 4.7, Question B1, asked has the programme developed the students' knowledge and intellectual capability, 41.3% agree and 20.1% strongly agree with this statement. 26% were satisfied, 11.2% unsatisfied and 0.7% strongly disagreed and agreed. This demonstrates the programme modules have increased the students' knowledge and intellectual capability.

Table 4.8: Frequency and percentage that the programme has increased respondents creative ability

	Frequency	Percentage
Strongly disagree	3	1.1
Disagree	9	3.3
Unsatisfied	45	16.7
Satisfied	95	35.3
Agree	87	32.3
Strongly agree	30	11.2
Total	269	100

Question B2, Table 4.8 asked has the programme increased the students' creative ability, 11.2% strongly agreed and 32.3% agreed with this statement, 35.3% were satisfied, 16.7% unsatisfied, 1.1% strongly disagree and 3.3% disagree. This demonstrates that the enterprise skills criteria of creative ability was developed and increased by the programme offered.

Table 4.9: Frequency and percentage that the programme has developed respondents consciousness

	Frequency	Percentage
Strongly disagree	3	1.1
Disagree	9	3.3
Unsatisfied	56	20.8
Satisfied	94	34.9
Agree	78	29
Strongly agree	29	10.8
Total	269	100

Question B3, Table 4.9 asked has the programme developed their commercial consciousness and 29% agreed, 10.8% were strongly agreed, 34.9% were satisfied with the programme having developed their commercial consciousness. There are 20.8% who were unsatisfied, with their commercial consciousness development. The rest indicated 3.3% disagree and 1.1% strongly disagreed. This demonstrates the enterprise skills were developed.

Table 4.10: Frequency and percentage that the programme has increased their self control and motivation

	Frequency	Percentage
Strongly disagree	1	.4
Disagree	3	1.1
Unsatisfied	33	12.3
Satisfied	87	32.3
Agree	107	39.8
Strongly agree	38	14.1
Total	269	100

Question B4, Table 4.10 asked has the programme increased their self control and motivation, and 39.8% agreed and 14.1% strongly agreed with the statement, 32.3% were satisfied, 14.1% strongly agreed, 12.3% were unsatisfied, 0.4% strongly disagreed and 1.1% disagreed. This demonstrates that the programme has increased the students self control and motivation

Table 4.11: Frequency and percentage that the programme has increased their self confidence tackling unfamiliar problems

	Frequency	Percentage
Strongly disagree	1	.4
Disagree	3	1.1
Unsatisfied	34	12.6
Satisfied	104	38.7
Agree	95	35.3
Strongly agree	32	11.9
Total	269	100

Question B5, Table 4.11 asked has the programme increased the students self confidence in tackling unfamiliar problems. 35.3% agreed and 11.9% strongly agreed, 38.7% were satisfied, 12.6% were unsatisfied, 0.4% and 1.1% strongly disagreed and disagreed, respectively. This demonstrates most of the students positively agreed that the programme had increased the level of their self confidence tackling unfamiliar problems.

Table 4.12: Frequency and percentage that the programme has improved respondents skills in formal and informal oral communication

	Frequency	Percentage
Strongly disagree	1	.4
Disagree	1	.4
Unsatisfied	41	15.2
Satisfied	91	33.8
Agree	81	30.1
Strongly agree	54	20.1
Total	269	100

Question B6, Table 4.12 asked has the programme improved the students skills in formal and informal oral communication, 20.1% strongly agreed and 30.1% agreed with the statement, 33.8% were satisfied, 15.2% were unsatisfied, 0.4% disagreed and strongly disagreed with it. This demonstrates that the programme has positively improved the engineering students' formal and informal oral communication.

Table 4.13: Frequency and percentage that the programme has improved respondents skills in formal and informal written communication

	Frequency	Percentage
Strongly disagree	0	0
Disagree	5	1.9
Unsatisfied	46	17.1
Satisfied	90	33.5
Agree	90	33.5
Strongly agree	38	14.1
Total	269	100

Question B7 Table 4.13 asked has the programme improved the students skills in formal and informal written communication, 14.1% strongly agreed and 33.5% agreed with the statement. 33.5% were satisfied, 17.1% were unsatisfied and 1.9% disagreed with it. This demonstrates that the programme has improved the students skills in formal and informal written communication

Table 4.14: Frequency and percentage that the programme has helped respondents to develop the ability to socialize at all levels and maintain the relationship

	Frequency	Percentage
Strongly disagree	2	.7
Disagree	7	2.6
Unsatisfied	32	11.9
Satisfied	78	29
Agree	101	37.5
Strongly agree	49	18.2
Total	269	100

Question B8 Table 4.14 asked has the programme helped the engineering undergraduates develop the ability to socialize at all levels and maintain the relationship, 37.5% agree and 18.2% strongly agreed with the statement. 29% were satisfied, 11.9% were unsatisfied, 2.6% disagreed and 0.7% strongly disagreed. This demonstrates that the programme helped the engineering undergraduate develop the ability to socialize at all levels and maintain the relationship.

Table 4.15: Frequency and percentage that the programme has helped respondents to develop the ability to work effectively with different groups

	Frequency	Percentage
Strongly disagree	1	.4
Disagree	4	1.5
Unsatisfied	23	8.6
Satisfied	83	30.9
Agree	112	41.6
Strongly agree	46	17.1
Total	269	100

Question B9 Table 4.15 asked has the programme helped the engineering undergraduate develop the ability to work effectively with different groups, 41.6% agreed and 17.1% strongly agreed with the statement. 30.9% were satisfied, 8.6% were unsatisfied, 0.4% strongly disagreed and 1.5% disagreed, respectively. This demonstrates that most of the engineering undergraduates have developed their ability to work effectively with different groups.

Table 4.16: Frequency and percentage that the programme has developed the students ability to plan and complete any project given

	Frequency	**Percentage**
Strongly disagree	0	0
Disagree	2	.7
Unsatisfied	22	8.2
Satisfied	82	30.5
Agree	117	43.5
Strongly agree	46	17.1
Total	269	100

Question B10 Table 4.16 asked has the programme developed the students' ability to plan and complete any project given. 43.5% agreed and 17.1% strongly agreed with the statement. 30.5% were satisfied, 8.2% were unsatisfied and 0.7% disagreed. This demonstrates that the programme has developed the students' ability to plan and complete any project given.

Table 4.17: Frequency and percentage that the programme has developed the students ability to identify problems, analyze and solve them

	Frequency	**Percentage**
Strongly disagree	1	.4
Disagree	1	.4
Unsatisfied	30	11.2
Satisfied	74	27.5
Agree	115	42.8
Strongly agree	48	17.8
Total	269	100

Question B11 Table 4.17 asked has the programme developed their ability to identify problems, analyze and solve them. 17.8% strongly agreed and 42.8% agreed with the statement. 27.5% were satisfied, 11.2% were unsatisfied, 0.4% strongly disagrees. This demonstrates that the programme has developed the student's ability to identify problems, analyze and solve them.

4.7.2. Section C: Generic Transfer Questionnaire (GTQ) on industrial training.

Table 4.18: Frequency and percentage that the industrial training has developed the respondents knowledge and intellectual capability

	Frequency	Percentage
Strongly disagree	1	.4
Disagree	4	1.5
Unsatisfied	21	7.8
Satisfied	56	20.8
Agree	105	39
Strongly agree	82	30.5
Total	269	100

Question C1 Table 4.18 asked has the industrial training developed the undergraduate engineering students knowledge and intellectual capability, 39% agreeing and 30.5% strongly agreed with the statement. 20.8% were satisfied, 7.8% unsatisfied, 1.5% disagreed and 0.4% strongly disagreed with it. This demonstrates that the industrial training has developed the undergraduate engineering students' knowledge and intellectual capability.

Table 4.19: Frequency and percentage that the industrial training has increased the respondents creative ability

	Frequency	Percentage
Strongly disagree	2	.7
Disagree	8	3
Unsatisfied	28	10.4
Satisfied	72	26.8
Agree	106	39.4
Strongly agree	53	19.7
Total	269	100

Question C2 Table 4.19 asked has the industrial training increased the student's creative ability, 39.4% agreed and 19.7% strongly agreed with the statement. 26.8% were satisfied, 10.4% were unsatisfied, 3% disagreed and 0.7% strongly disagreed. This demonstrates that the industrial training has increased the students' creativity ability.

Table 4.20: Frequency and percentage that the industrial training has developed the respondents commercial consciousness

	Frequency	Percentage
Strongly disagree	3	1.1
Disagree	0	0
Unsatisfied	20	7.4
Satisfied	75	27.9
Agree	110	40.9
Strongly agree	61	22.7
Total	269	100

Question C3 Table 4.20 asked has the industrial training developed the students' commercial consciousness. 40.9% agreed and 22.7% strongly agreed with the statement. 27.9% were satisfied, 7.1% were unsatisfied and 1.1% strongly disagreed. This demonstrates that the industrial training has developed the students' commercial consciousness.

Table 4.21: Frequency and percentage that the industrial training has increased the respondents self control and motivating

	Frequency	Percentage
Strongly disagree	1	.4
Disagree	3	1.1
Unsatisfied	22	8.2
Satisfied	67	24.9
Agree	106	39.4
Strongly agree	70	26
Total	269	100

Question C4 Table 4.21 asked has the industrial training increased engineering undergraduates self control and motivation. 39.4% agreed and 26% strongly agreed with the statement, 24.9% were satisfied, 8.2% were unsatisfied, 1.1% disagreed and 0.4% strongly disagrees with it. This demonstrates most of the students positively agreed that the industrial training has increased engineering undergraduate self control and motivation.

Table 4.22: Frequency and percentage that the industrial training has increased the respondents self confidence tackling unfamiliar problems

	Frequency	Percentage
Strongly disagree	3	1.1
Disagree	1	.4
Unsatisfied	21	7.8
Satisfied	68	25.3
Agree	101	37.5
Strongly agree	75	27.9
Total	269	100

Question C5 Table 4.22 asked has the industrial training increased the students' self confidence tackling unfamiliar problems. 37.5% agree and 27.9% strongly agreed, and 25.3% were satisfied with the statement. 7.8% were unsatisfied, 1.1 strongly disagreed and 0.4% disagreed with it. This demonstrates that the industrial training has increased the students' self confidence in tackling unfamiliar problems.

Table 4.23: Frequency and percentage that the industrial training has improved the respondents skills in formal and informal oral communication

	Frequency	Percentage
Strongly disagree	0	0
Disagree	2	.7
Unsatisfied	19	7.1
Satisfied	76	28.3
Agree	87	32.3
Strongly agree	85	31.6
Total	269	100

Question C6 Table 4.23 asked has the industrial training improved the engineering undergraduate skills in formal and informal oral communication. 32.3% agreed and 31.6% strongly agreed with the statement. This was followed by 28.3% being satisfied, 7.1% were unsatisfied and only 0.7% disagreed with it. This demonstrates the industrial training has improved the engineering undergraduate in formal and informal oral communication.

Table 4.24: Frequency and percentage that the industrial training has improved the respondents skills in formal and informal written communication

	Frequency	Percentage
Strongly disagree	2	.7
Disagree	2	.7
Unsatisfied	27	10
Satisfied	86	32
Agree	95	35.3
Strongly agree	57	21.2
Total	269	100

Question C7 Table 4.24 asked has the industrial training improved the students' skills in formal and informal written communication. 35.3% agreed, 21.2% strongly agreed and 32% were satisfied with the statement. 10% were unsatisfied, 0.7% both strongly disagreed and disagreed. This demonstrates a positive feedback and the industrial training have improved the students' skills in formal and informal written communication.

Table 4.25: Frequency and percentage that the industrial training has developed respondents ability to socialize at all levels and maintain the relationship

	Frequency	Percentage
Strongly disagree	1	.4
Disagree	1	.4
Unsatisfied	15	5.6
Satisfied	58	21.6
Agree	117	43.5
Strongly agree	77	28.6
Total	269	100

Question C8 Table 4.25 asked has the industrial training helped engineering undergraduates develop their ability to socialize at all levels and maintain the relationship. 43.5% agreed, 28.6% strongly agreed and 21.6% were satisfied. This was followed by 5.6% who were unsatisfied and those who strongly disagree and disagree both yielded 0.4%. This demonstrates that the industrial training has helped engineering undergraduates develop their ability to socialize at all levels and maintain the relationship.

Table 4.26: Frequency and percentage that the industrial training has helped the students to developed their ability to work effectively with different groups

	Frequency	Percentage
Strongly disagree	1	.4
Disagree	0	0
Unsatisfied	18	6.7
Satisfied	58	21.6
Agree	116	43.1
Strongly agree	76	28.3
Total	269	100

Question C9 Table 4.26 asked has the industrial training helped the students to develop their ability to work effectively with different groups. 43.1% agreed, 28.3% strongly agreed and 21.6% were satisfied with the statement. 6.7% were unsatisfied and 0.4% strongly disagreed with it. This demonstrates that the industrial training has helped them to develop their ability to work effectively with different groups.

Table 4.27: Frequency and percentage that the industrial training has helped the respondents to develop the ability to plan and complete any project given

	Frequency	Percentage
Strongly disagree	4	1.5
Disagree	1	.4
Unsatisfied	22	8.2
Satisfied	64	23.8
Agree	104	38.7
Strongly agree	74	27.5
Total	269	100

Question C10 Table 4.27 asked has the industrial training helped the students to develop their ability to plan and complete any project given. 38.7% agreed, 27.5% strongly agreed and 23.8% were satisfied with the statement. 8.2% were unsatisfied, 1.5% strongly disagreed and only 0.4% disagreed with the statement. This demonstrates that the industrial training has helped the students to develop their ability to plan and complete any project given.

Table 4.28: Frequency and percentage that the industrial training has developed the students ability to identify problems, analyze and solve them

	Frequency	Percentage
Strongly disagree	2	.7
Disagree	2	.7
Unsatisfied	16	5.9
Satisfied	75	27.9
Agree	101	37.5
Strongly agree	73	27.1
Total	269	100

Question C11 Table 4.28 asked has the industrial training developed the students' ability to identify problems, analyze and solve them. 37.5% agreed, 27.1% strongly agreed and 27.9% were satisfied with the statement. 5.9% unsatisfied and both 0.7%

are strongly disagreed and disagreed. This demonstrates that the industrial training has developed the students' ability to identify problems, analyze and solve them.

4.7.3 Section D: Generic Transfer Questionnaire (GTQ) on university life and co-curriculum activity.

Table 4.29: Frequency and percentage that the university life and co-curriculum activity has develop the respondents knowledge and intellectual capability

	Frequency	Percentage
Strongly disagree	3	1.1
Disagree	5	1.9
Unsatisfied	39	14.5
Satisfied	83	30.9
Agree	89	33.1
Strongly agree	50	18.6
Total	269	100

Question D1 Table 4.29 asked has the university life and co-curriculum activity developed the students' knowledge and intellectual capability. 33.1% agreed, 18.6% strongly agreed and 30.9% were satisfied with the statement. 14.5% were unsatisfied, 1.9% disagreed and 1.1% strongly disagreed with it. This demonstrates that the university life and co-curriculum activity has developed the students' knowledge and intellectual capability.

Table 4.30: Frequency and percentage that the university life and co-curriculum activity has increased the respondents creativity ability

	Frequency	Percentage
Strongly disagree	2	.7
Disagree	7	2.6
Unsatisfied	41	15.2
Satisfied	95	35.3
Agree	80	29.7
Strongly agree	44	16.4
Total	269	100

Question D2 Table 4.30 asked has the university life and co-curriculum activity increased the students' creativity ability. 29.7% agreed, 16.4% strongly agreed and 35.3% were satisfied with the statement. 15.2% were unsatisfied, 2.6% disagreed and 0.7% strongly disagreed with it. This demonstrates that the university life and co-curriculum activity have increased the students' creativity ability.

Table 4.31: Frequency and percentage that the university life and co-curriculum activity has developed the respondents commercial consciousness

	Frequency	Percentage
Strongly disagree	3	1.1
Disagree	9	3.3
Unsatisfied	53	19.7
Satisfied	78	29
Agree	87	32.3
Strongly agree	39	14.5
Total	269	100

Question D3 Table 4.31 asked has the university life and co-curriculum activity developed the engineering undergraduate's commercial consciousness. 32.3% agreed, 14.5% strongly agreed and 29% were satisfied with the statement. 19.7% were unsatisfied, 3.3% disagreed and 1.1% strongly disagreed with the statement. This demonstrates that the university life and co-curriculum activity has developed the engineering undergraduate's commercial consciousness.

Table 4.32: Frequency and percentage that the university life and co-curriculum activity has increased the respondents self control and motivation

	Frequency	Percentage
Strongly disagree	3	1.1
Disagree	4	1.5
Unsatisfied	37	13.8
Satisfied	71	26.4
Agree	102	37.9
Strongly agree	52	19.3
Total	269	100

Question D4 Table 4.32 asked has the university life and co-curriculum activity increased the students' self control and motivation. 37.9% agreed, 19.3% strongly agreed and 26.4% were satisfied with the statement. 13.8% were unsatisfied, 1.5% disagreed and 1.1% strongly disagreed with it. This too demonstrates that the university life and co-curriculum activity has increased the students' self control and motivation.

Table 4.33: Frequency and percentage that the university life and co-curriculum activity has increased the respondents self confidence in tackling unfamiliar problems

	Frequency	**Percentage**
Strongly disagree	0	0
Disagree	8	3.0
Unsatisfied	37	13.8
Satisfied	89	33.1
Agree	84	31.2
Strongly agree	51	19.0
Total	269	100

Question D5 Table 4.33 asked has the university life and co-curriculum activity increased the students' self confidence tackling unfamiliar problems. 31.2% agreed, 19% strongly agreed and 33.1% were satisfied with the statement. 13.8% were unsatisfied and 3% disagreed with it. This demonstrates that the university life and co-curriculum activity have increased the students' self confidence tackling unfamiliar problems.

Table 4.34: Frequency and percentage that the university life and co-curriculum activity has improved the respondents formal and informal oral communication skill

	Frequency	Percentage
Strongly disagree	1	0.4
Disagree	8	3.0
Unsatisfied	32	11.9
Satisfied	78	29.0
Agree	93	34.6
Strongly agree	57	21.2
Total	269	100

Question D6 Table 4.34 asked has university life and co-curriculum activity improved the engineering undergraduates' formal and informal oral communication skill. 34.6% agreed, 21.2% strongly agreed and 29% were satisfied with the statement. 11.9% were unsatisfied, 3% disagreed and 0.4% strongly disagreed. This demonstrates that university life and co-curriculum activity have improved the engineering undergraduates formal and informal oral communication skill.

Table 4.35: Frequency and percentage that the university life and co-curriculum activity has improved the respondents formal and informal written communication skill

	Frequency	Percentage
Strongly disagree	3	1.1
Disagree	8	3.0
Unsatisfied	43	16.0
Satisfied	88	32.7
Agree	81	30.1
Strongly agree	46	17.1
Total	269	100

Question D7 Table 4.35 asked has the university life and co-curriculum activity improved the students' skills in formal and informal written communication. 30.1% agreed, 17.1% strongly agreed and 32.7% were satisfied with the statement. 16% were unsatisfied, 3% disagreed and 1.1% strongly disagreed with it. This demonstrates a positive feedback and that the university life and co-curriculum activity have improved the students' skills in formal and informal written communication.

Table 4.36: Frequency and percentage that the university life and co-curriculum activity has helped to developed the ability to socialize at all levels and maintain the relationship

	Frequency	**Percentage**
Strongly disagree	3	1.1
Disagree	2	0.7
Unsatisfied	30	11.2
Satisfied	71	26.4
Agree	101	37.5
Strongly agree	62	23.0
Total	269	100

Question D8 Table 4.36 asked has the university life and co-curriculum activity helped the respondents to develop their ability to socialize at all levels and maintain the relationship. 37.5% agreed, 23% strongly agreed and 26.4% were satisfied with the statement. 11.2% were unsatisfied, 1.1% strongly disagreed and 0.7% disagreed with it. This demonstrates that the university life and co-curriculum activity have helped the respondents to develop their ability to socialize at all levels and maintain the relationship.

Table 4.37: Frequency and percentage that the university life and co-curriculum activity has helped to developed the ability to work effectively with different groups

	Frequency	**Percentage**
Strongly disagree	3	1.1
Disagree	2	0.7
Unsatisfied	30	11.2
Satisfied	71	26.4
Agree	101	37.5
Strongly agree	62	23.0
Total	269	100

Question D9 Table 4.37 asked has the university life and co-curriculum activity helped the respondent to develop their ability to work effectively with different groups. 33.1% agreed, 20.8% strongly agreed and 32% were satisfied with the statement. 12.3% were unsatisfied, 1.5% disagreed and 0.4% strongly disagreed with it. This demonstrates that the university life and co-curriculum activity have helped the respondents to develop their ability to work effectively with different groups.

Table 4.38: Frequency and percentage that the university life and co-curriculum activity has helped to developed the ability to plan and complete any project given

	Frequency	Percentage
Strongly disagree	2	0.7
Disagree	8	3.0
Unsatisfied	24	8.9
Satisfied	86	32.0
Agree	101	37.5
Strongly agree	48	17.8
Total	269	100

Question D10 Table 4.38 asked has the university life and co-curriculum activity helped the respondents to develop their ability to plan and complete any project given. 37.5% agreed, 17.8% strongly agreed and 32% were satisfied with the statement. 8.9% were unsatisfied, 3% disagreed and 0.7% strongly disagreed. This demonstrates that the university life and co-curriculum activity have helped the respondents to develop their ability to plan and complete any project given.

Table 4.39: Frequency and percentage that the university life and co-curriculum activity has helped to developed the ability to identify problems, analyze and solve them

	Frequency	**Percentage**
Strongly disagree	3	1.1
Disagree	7	2.6
Unsatisfied	35	13.0
Satisfied	74	27.5
Agree	96	35.7
Strongly agree	54	20.1
Total	269	100

Question D11 Table 4.39 asked has the university life and co-curriculum activity developed the ability to identify problems, analyze and solve them. 35.7% agreed, 20.1% strongly agreed and 27.5% were satisfied with the statement. 13% were unsatisfied, 2.6% disagreed and 1.1% strongly disagreed with it. This demonstrates that the university life and co-curriculum activity have developed the ability to identify problems, analyse and solve them.

4.8 Data reduction analysis

4.8.1 Exploring the factor analysis of the Generic Transferable Questionnaire (GTQ) constructs

4.8.1.1 Correlation Matrix

The analysis result shows the KMO adequacy of the correlation matrix is .932. According to Kaiser (1974) guidance for interpreting the measure (Michael, 1994) is as follows:

In the .90's - marvellous

In the .80's - meritorious

In the .70's - middling

In the .60's - mediocre

In the .50's - miserable

Below.50 - unacceptable.

Bartlett's test of sphericity (see Table 4.40) tests the adequacy of the correlation matrix and yielded a value of 7795.238 and an associated level of significance smaller than 0.001. This procedure determines whether the data deviates significantly from a random matrix (Weiss, 1970). Thus, the correlation matrix has significant correlation amongst at least some of the variables.

Table 4.40 : KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.932
Bartlett's Test of Sphericity	Approx. Chi-Square	7795.238
	df	528
	Sig.	.000

4.8.1.2 Factor analysis output

The Total Variance Explained (Appendix 7) presents the number of common factors extracted, the eigenvalues associated with these factors, the percentage of total variance accounted for by each factor and the cumulative percentage of total variance accounted for by the factors. Using the criterion of retaining only factors with eigenvalues of 1, five factors were retained for rotation. These five factors accounted for 40.96%, 16.26%, 9.13%, 3.3% and 3.1% of the total variance, respectively, and a total of 72.66%.

The Rotated Component Matrix presents the five factors after a varimax rotation. The Rotated Component Matrix shows that there are items that are loaded or overlap in meaning between factor 3, factor 4 and factor 5. The words 'effect, written and oral' used in the question overlaps in meaning. The communality in meaning of some of these factors suggests that a number of factors can be combined or deleted for a better result. Therefore, the researcher decided to delete the overlap or cross loading items and rerun the analysis.

4.8.1.3. Result after deletion of overloading items

The second Correlation Matrix (Table 4.41) analysis shows the KMO adequacy of the correlation matrix is .928. Bartlett's test of sphericity tests the adequacy of the correlation matrix and yielded a value of 7050.833 and an associated level of significance smaller than 0.001. Even though the scores are lower from the previous test it remains high.

Table 4.41: KMO and Bartlett's Test (second run)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.928
Bartlett's Test of Sphericity	Approx. Chi-Square	7050.833
	df	435
	Sig.	.000

The result of the second run of factor analysis output Table 4.42 shows the Total Variance explained using the criterion of retaining only factors with eigenvalues of 1, four factors were retained for rotation. These four factors accounted for 41.396%, 17.818%, 8.340%, and 3.394% of the Total Variance, respectively, and for a total of 70.948%.

Table 4.42 : Total Variance Explained

Factor	Eigenvalue	Percentage of variance	Cumulative percentage
1	12.419	41.396	41.396
2	5.345	17.818	59.214
3	2.502	8.340	67.554
4	1.018	3.394	70.948

According to Lewis (1984), "reasonable comprehensiveness" (p.68) is maintained when extracted factors explain at least 60% of variance. Table 42 shows that the total variance explained by all four factors is somewhat higher, at around 71%. Table 4.43 shows the abbreviated results of the factor analysis of determinant attributes. For a sample size of 269, and in accordance with the recommendations of Tabachnik and

Fidell (2001), correlations of less than 0.45 were deemed to be unexceptional. Therefore, Table 43 only presents coefficients greater than this. The grouping of variables with high factor loadings should suggest what the underlying dimension is for that factor. The rotated component matrix presents the four factors after varimax rotation. The clustering of the items in each factor and their wording offers the best clue as to the meaning of that factor. For example, eleven items loaded on Factor 1. An inspection of these items shows an evaluation of university life and co-curriculum activities (e.g. university life and co-curriculum developed my knowledge and intellectual capability, university life and co-curriculum increased my creativity ability, university life and co-curriculum improved my skills in formal and informal oral communication, etc.) and was thus labelled **UNIVERSITY/CO-CURRICULUM** . Factor 2 contains eleven items that clearly reflect evaluation of industrial training (e.g. the industrial training helped me to develop the ability to work effectively with different groups, the industrial training developed the ability to identify problems, analyse and solve them, the industrial training developed my commercial consciousness etc.) and was labelled **INDUSTRIAL TRAINING**. Factor 3 contains 6 items that reflect programme evaluation (e.g. the programme increased myself control and motivation, the programme increased myself confidence in tackling unfamiliar problems, the programme helped me to develop the ability to socialize at all levels and maintain relationships etc.) and was labelled **PROGRAMME**. Factor 4 contains 2 items that reflect the enterprise skills (the programme helped me to develop the ability to plan and complete any project given and the programme developed the ability to identify problems, analyze and solve them) and was labelled **ENTERPRISE.** This four-factor model represents the combination of the five original factors and appears to reflect adequately the underlying factor structure of the 41-item generic transfer inventory.

Table 4.43 : Rotated Component Matrix

	Factors			
Items	1	2	3	4
d- Increased intellectual capability	.806			
d- Increased creativity ability	.803			
d- Developed commercial consciousness	.710			
d- Increased myself control & motivation	.852			
d- Increased myself confidence tackling problem	.870			
d- Improved formal/informal oral communication	.831			
d- Improved formal/informal written communication	.746			
d- Developed the ability to socialize at all levels and maintain the relationship	.817			
d- Ability to work effective with different groups	.832			
d- Developed the ability to plan and complete any project given	.824			
d- Ability to identify problems, analyze and solve them	.845			
c- Increased intellectual capability		.752		
c- Increased creativity ability		.778		
c- Developed commercial consciousness		.757		
c- Increased myself control & motivation		.854		
c- Increased myself confidence tackling problem		.873		
c- Improved formal/informal oral communication		.812		
c- Improved formal/informal written communication		.768		
c- Developed the ability to socialize at all levels and maintain the relationship		.802		
c- Ability to work effective with different groups		.821		
c- Developed the ability to plan and complete any project given		.858		
c- Ability to identify problems, analyze and solve them		.831		
b- Increased intellectual capability			.738	
b- Increased creativity ability			.768	
b- Developed commercial consciousness			.751	
b- Increased myself control & motivation			.774	
b- Increased myself confidence tackling problem			.657	
b- Developed the ability to socialize at all levels and maintain the relationship			.651	
b- Ability to work effective with different groups				
b- Developed the ability to plan and complete any project given				.709
b- Ability to identify problems, analyze and solve them				.756

Note: b represent for programme evaluation
c represent for industrial training evaluation
d represent for university life and co-curriculum evaluation

4.9 Engineering student reliability output

Total samples of 269 cases were processed in this analysis. There are no missing values. The Cronbach's Alpha score is 0.955, which indicates high overall internal consistency as recommended by Cronbach(1949) the alpha value of .60 is considered reliable among the items representing programme evaluation factor, industrial training factor and university life and co-curriculum activity factor. The corrected item-total correction shows the correlation (consistency) between each item and the sum of the remaining items.

4.10 Employer statistical results

4.10.1 Overview of the population under study: industrial employers

The objective to involve the employer in this study was to explore the employer's response towards the industrial training delivered to the engineering student as their trainee. The researcher would like to explore if the employer has delivered quality training to the student during their industrial training which takes around 12 weeks or 3 months on the employer premises.

The employer population identified in this study is established through probability random sampling. This method is useful if the researcher wishes to be able to make generalizations, because it seeks representativeness of a wider population. A probability sampling has less risk of bias. The researcher, with the help from the university industrial training or placement officer, was given a list of employer companies names, contact numbers and emails which provide industrial training to the engineering students. From these, 20 employers have been identified.

The researcher has contacted them and spoken with the person who is in charge of monitoring industrial training trainee and enquired about their willingness to participate in the study. Through telephone conversations, the response was positive but when the questionnaires were delivered to them, they took quite some time to return them. The researcher then had to call and re-fax (questionnaire mislaid or missing) the questionnaire and follow up with a confirmatory telephone call and after completion request for it to be faxed back to the researcher. Some employers responded through email. Out of 20 delivered questionnaires, only 16 were returned to the researcher.

The employers participating in this research are from a variety of operations such as a semiconductors, aircraft maintenance and services, manufacturing, oil and gas, tunnel construction, housing development, electronic manufacturing, pressure gauge manufacturing and automation and control solution industrial processes.

4.10.2 Descriptive analysis

The responses received from the employers were very good after the follow-up telephone calls. Participants gave their ratings on a six-point Likert scale ranging from 1, indicating strongly disagree to scale 6, strongly agree similar as to the students scale as mentioned before at section 4.7.

4.10.2.1 Analysis of employer characteristics

4.10.2.1.1 Physical location.

Table 4.44: Physical location

State	Frequency	Percentage
Melaka	2	12.5
Selangor	8	50
Kuala Lumpur	2	12.5
Kelantan	1	6.3
Penang	1	6.3
Negeri Sembilan	1	6.3
Johor	1	6.3
Total	16	100

Table 4.44 illustrates the employer's physical location in this study. About 50 percent of the employers are located in Selangor, while 12.5 percent of employers are located in Melaka and Kuala Lumpur. The others representing 6.3% each are located in Kelantan, Penang, Negeri Sembilan and Johor.

4.10.2.1.2 Type of business

Table 4.45: Type of business

Type of business	Frequency	Percentage
Semiconductor	1	6.3
Aircraft maintenance and service	1	6.3
Manufacturing	3	18.8
Oil industry	1	6.3
Tunnel construction	1	6.3
Housing developer	1	6.3
Electronic manufacturing	1	6.3
Pressure gauge manufacturing	1	6.3
Automation and control solution, industrial process	1	6.3
Generate electricity	1	6.3
Sea port container handling	1	6.3

Airline engineering	1	6.3
Automotive industry	1	6.3
Fertilizer manufacturing	1	6.3
Total	16	100

18.8% of the employers in Table 4.45 are from a manufacturing type of business. The other types of business such as semiconductors, aircraft maintenance and service, oil industry, tunnel construction, housing developer, electronic manufacturing, pressure gauge manufacturing, automation and control solution, industrial process, generate electricity, sea port container handling, airline engineering, automotive industry, and fertilizer manufacturing represented 6.3% each.

4.10.2.1.3 Size of the company

Table 4.46: Company size

Ranges	Frequency	Percentage
Less 250 employee: turn over per year less than RM25 million	6	40
More than 250 employees; turnover per year more than RM25 million	9	60
Missing Data	1	6.3
Total	16	100

In terms of company size, as shown in Table 4.46, 56.3% of employers have more than 250 employees or their turnover per year is more than RM25 million. 37.5% of employers have less than 250 employees or their turnover per year less than RM25 million. One company did not respond.

4.10.2.1.4 Length of time the business has operated

Table 4.47: Length of time the business has operated

Ranges	Frequency	Percentage
1-10 years	3	20
11-20 years	4	26.7
21-30 years	4	26.7
31-40 years	2	13.3
41-50 years	2	13.3
Missing Data	1	6.3
Total	16	100

Table 4.47 shows the length of time the business has operated. In the range between 1-10 years, there are 18.8% of employers. 26.7% of employers have been in business from 11-20 years. 25% of employers have been in operation for 21-30 years. There are 13.3 percent of employer operated their business between 31-40 years and 41-50 years, respectively. 1company did not respond.

4.10.3 Employer frequency results.

4.10.3.1. Generic Transfer Questionnaire (GTQ) on industrial training.

Table 4.48: Frequency and percentage the industrial training has developed trainees knowledge and intellectual capability

	Frequency	Percentage
Strongly disagree	0	0
Disagree	0	0
Unsatisfied	2	12.5
Satisfied	6	37.5
Agree	5	31.3
Strongly agree	3	18.8
Total	16	100

In Table 4.48, 37.5% of the respondents were satisfied that the industrial training developed trainee’s knowledge and intellectual capability, followed by 31.3% who agreed and 18.8% strongly agreed with the statement. 12.5% were unsatisfied with it. This demonstrates that the employers positively had agreed the industrial training having developed trainee's knowledge and intellectual capability.

Table 4.49: Frequency and percentage the industrial training has increased the trainees creative ability

	Frequency	Percentage
Strongly disagree	0	0
Disagree	0	0
Unsatisfied	1	6.3
Satisfied	8	50.0
Agree	6	37.5
Strongly agree	1	6.3
Total	16	100

Of those who responded to the question that has industrial training increased trainee's creative ability in Table 4.49, 50% were satisfied and 37.5% agreed with the statement. 6.3% both strongly agreed and unsatisfied with the statement. This also demonstrates a very positive relationship by the employers toward the industrial training.

Table 4.50: Frequency and percentage the industrial training has increased the trainees self control and motivation

	Frequency	Percentage
Strongly disagree	0	0
Disagree	1	6.3
Unsatisfied	2	12.5
Satisfied	9	56.3
Agree	2	12.5
Strongly agree	2	12.5
Total	16	100

The GTQ measurement in Table 4.50 has identified that 56% were satisfied that industrial training has increased the trainee's self control and motivation. 12.5% strongly agreed, agreed or were unsatisfied. Only 6.3 % disagreed and nobody strongly disagreed. This also demonstrates the positive relationship.

Table 4.51: Frequency and percentage the industrial training has developed commercial consciousness

	Frequency	Percentage
Strongly disagree	0	0
Disagree	0	0
Unsatisfied	3	18.8
Satisfied	8	50.0
Agree	4	25.0
Strongly agree	1	6.3
Total	16	100

The GTQ results shown in Table 4.51 illustrated that 50% were satisfied that the industrial training has developed the trainee's commercial consciousness. This is followed by 25% agreeing with the statement. Approximately, 18.8% were unsatisfied and 6.3% strongly agreed with it. This demonstrates positive response from the employers.

Table 4.52: Frequency and percentage the industrial training has increased respondents self confidence in tackling unfamiliar problems

	Frequency	Percentage
Strongly disagree	0	0
Disagree	0	0
Unsatisfied	0	0
Satisfied	8	50.0
Agree	5	31.3
Strongly agree	3	18.8
Total	16	100

Table 4.52 shows that industrial training has increased trainee's self confidence in tackling unfamiliar problems, 50% were satisfied and 31.3% agreed with the statement, while 18.8% strongly agreed.

Table 4.53: Frequency and percentage the industrial training has improved respondents skills in formal and informal oral communication

	Frequency	Percentage
Strongly disagree	0	0
Disagree	1	6.3
Unsatisfied	3	18.8
Satisfied	6	37.5
Agree	4	25.0
Strongly agree	2	12.5
Total	16	100

The GTQ measurement of Table 4.53 shows that 37.5% were satisfied that industrial training has improved the trainee's skills in formal and informal oral communication, 25% agreed with the statement. 18.8% were unsatisfied and 12.5% strongly agreed and 6.3 % disagreed with the statement.

Table 4.54: Frequency and percentage the industrial training has improved respondents skills in formal and informal written communication

	Frequency	Percentage
Strongly disagree	0	0
Disagree	2	12.5
Unsatisfied	3	18.8
Satisfied	7	43.8
Agree	2	12.5
Strongly agree	2	12.5
Total	16	100

Most of the respondents (43.8%) in Table 4.54 are satisfied that the industrial training has improved trainee's skills in formal and informal written communication, followed by 18.8% who were unsatisfied. 12.5% were agreed, strongly agreed or disagreed. The employers gave a positive response to this question.

Table 4.55: Frequency and percentage the industrial training has helped trainees to develop the ability to socialize at all levels and maintaining the relationship

	Frequency	Percentage
Strongly disagree	0	0
Disagree	0	0
Unsatisfied	3	18.8
Satisfied	4	25.0
Agree	8	50.0
Strongly agree	1	6.3
Total	16	100

In response to the statement in Table 4.55 has industrial training helped the trainees to develop the ability to socialize at all levels and maintaining the relationship through change, 50% agreed and 25% were satisfied with the statement. Respectively, 6.3% strongly agreed and 18.8% were unsatisfied with it.

Table 4.56: Frequency and percentage the industrial training has helped trainees to develop the ability to work effectively with different groups

	Frequency	Percentage
Strongly disagree	0	0
Disagree	0	0
Unsatisfied	2	12.5
Satisfied	3	18.8
Agree	7	43.8
Strongly agree	4	25.0
Total	16	100

The GTQ measurement of Table 4.56 shows that 43.8% agree that industrial training helps trainees to develop the ability to work effectively with different groups. 25% of the respondents strongly agreed with it while 18.8% were satisfied that the industrial training has helped trainees to develop their ability to work effectively with different groups. Only 12.5 % were unsatisfied with the statement.

Table 4.57: Frequency and percentage the industrial training has helped trainees to develop the ability to identify problems, analyze and solve them

	Frequency	Percentage
Strongly disagree	0	0
Disagree	3	18.8
Unsatisfied	2	12.5
Satisfied	7	43.8
Agree	2	12.5
Strongly agree	2	12.5
Total	16	100

Most of the respondents (43.8%) in Table 4.57 are satisfied that the industrial training has developed the ability to identify problems, analyze and solve them. Approximately, 18.8% disagreed that the industrial training has developed the ability to identify problems, analyze and solve them. Those that agreed, strongly agreed or were unsatisfied with it, each accounted for 12.5%. This demonstrates roughly 31.3% do not agree with the statement.

Table 4.58: Frequency and percentage the industrial training has helped trainees to develop the ability to plan and complete any project given

	Frequency	Percentage
Strongly disagree	0	0
Disagree	0	0
Unsatisfied	3	18.8
Satisfied	5	31.3
Agree	6	37.5
Strongly agree	2	12.5
Total	16	100

Of those in Table 4.58 who thought that industrial training has helped trainees to develop their ability to plan and complete any project given, 37.5% agreed, 12.5% strongly agreed and 31.3% were satisfied with the statement. However, 18.8% were unsatisfied with it. This demonstrates that employers through industrial training had helped trainees to develop their ability to plan and complete any project given.

4.10.4 Employer reliability output.

Of the total sample of 16 all the cases were processed in this analysis. There are no missing values. The Cronbach's Alpha score is 0.888, which indicates high overall internal consistency as recommended by Cronbach(1949) and with an alpha value of .60 or higher for the factors relating to industrial training.

4.11 Triangulation between engineering undergraduates Generic Transfer Questionnaire (GTQ) results in industrial training and the employer results.

Table 4.59: Relationship that the industrial training has developed my/trainee's knowledge and intellectual capability

Respondent	Strongly Disagree	Disagree	Unsatisfied	Satisfied	Agree	Strongly Agree	Total
Employer	0	0	12.5%	37.5%	31.3%	18.8%	100%
Student	0.4%	1.5%	7.8%	20.8%	39.0%	30.5%	100%

In Table 4.59, the GTQ result about industrial training shows weight or positive indications on the right hand of the table. 39% of students agreed that the industrial training has developed the undergraduate engineering student's knowledge and intellectual capability. This is supported by 31.3% of employers agreeing on the matter. 30.5% of students gave a strongly agree response, whilst 18.8% of employers responded similarly. 20.8% of students were satisfied that industrial training has developed their knowledge and intellectual capability, while, 37.5% of employer's supported this. The rest of the students indicated 7.8% were unsatisfied, 1.5% disagreed and 0.4% strongly disagreed with it. With regards to the employers, 12.5% were unsatisfied with this statement.

Table 4.60: Relationship the industrial training has increased my/trainee's creativity ability

Respondent	Strongly Disagree	Disagree	Unsatisfied	Satisfied	Agree	Strongly Agree	Total
Employer	0	0	6.3%	50.0%	37.5%	6.3%	100%
Student	0.7%	3.0%	10.4%	26.8%	39.4%	19.7%	100%

Similar to Table 4.59, Table 4.60 shows that both employer and engineering student have most scores are on the right of the table. Most of the engineering undergraduates (39.4%) in Table 4.60 agreed that the industrial training had increased their creativity ability, while 37.5% of employers also agreed. 26.8% of student respondents were satisfied with it, and 50% of the employers were satisfied that industrial training had increased their creativity and ability. 19.7% of students strongly agreed as did 6.3% of the employers. This was followed by 10.4% who were unsatisfied, 3% who disagreed and 0.7% who strongly agreed that the level of their creativity ability has increased. With regards to this point 6.3% of the employers were unsatisfied.

Table 4.61: Relationship that the industrial training has developed my/trainee's commercial consciousness

Respondent	Strongly Disagree	Disagree	Unsatisfied	Satisfied	Agree	Strongly Agree	Total
Employer	0	0%	18.8%	50.0%	25.0%	6.3%	100%
Student	1.1%	0%	7.4%	27.9%	40.9%	22.7%	100%

Table 4.61 shows the response to the statement that the industrial training had developed their commercial consciousness. Of the student respondents 7.4% were unsatisfied and 1.1% strongly disagreed. 18.8% of the employers supported this view.

Most of the engineering undergraduates (40.9%) agreed while 25% of the employers supported this and (27.9%) of the students were satisfied, with 50% of employers satisfied on this matter, 22.7% of students strongly agreed as did 6.3% of employers.

Table 4.62: Relationship that the industrial training has increased my/trainee's self control and motivation

Respondent	Strongly Disagree	Disagree	Unsatisfied	Satisfied	Agree	Strongly Agree	Total
Employer	0%	6.3%	12.5%	56.3%	12.5%	12.5%	100%
Student	0.4%	1.1%	8.2%	24.9%	39.4%	26.0%	100%

Table 4.62 shows industrial training and an increased engineering undergraduate self control and motivation. 39.4% of students agreed that industrial training has increase students self control and motivation and 12.5% of employers also agreed. 26% of the students strongly agreed, with 12.5% of the employers also agreeing. It is followed by 24.9% of the students who were satisfied 56.3% of employers agreed. 8.2% students were unsatisfied, the employer shows 12.5%. This was followed by 1.1% of students who disagreed and 0.4% strongly disagreed. From the table only 6.3% of employers disagreed that the industrial training had increased trainee's self control and motivation.

Table 4.63: Relationship that the industrial training has increased my/trainee's self confidence in tackling unfamiliar problems

Respondent	Strongly Disagree	Disagree	Unsatisfied	Satisfied	Agree	Strongly Agree	Total
Employer	0%	0%	0%	50.0%	31.3%	18.8%	100%
Student	1.1%	0.4%	7.8%	25.3%	37.5%	27.9%	100%

Most of the engineering undergraduates 37.5% in Table 4.63 agreed that the industrial training had increased their self confidence in tackling unfamiliar problems. This is supported by 31.3% of employers. 27.9% of students strongly agreed and 25.3% were satisfied that industrial training had increased their self confidence in tackling unfamiliar problems. The employers supported the above with 18.8% strongly agreeing and 50% were satisfied with the statement. While, 7.8% of student respondents were unsatisfied, 1.1% strongly disagreed and 0.4% disagreed with it.

Table 4.64: Relationship that the industrial training has improved my/trainee's skills in formal and informal oral communication

Respondent	Strongly Disagree	Disagree	Unsatisfied	Satisfied	Agree	Strongly Agree	Total
Employer	0%	6.3%	18.8%	37.5%	25.0%	12.5%	100%
Student	0%	0.7%	7.1%	28.3%	32.3%	31.6%	100%

Table 4.64 shows that the industrial training has improved the engineering undergraduates in their formal and informal oral communication with 32.3% of the students agreeing, and 25% of employers supporting it. 31.6% of students strongly agreed with the statement, while 12.5% of employers supported it. This was followed by 28.3% of students who were satisfied, 7.1% were unsatisfied and only 0.7% disagreed with it. Whereas, 37.5% of the employers are satisfied with the statement, 18.8% of them are unsatisfied and 6.3% disagreed.

Table 4.65:Relationship that the industrial training has improved my/trainee's skills in formal and informal written communication

Respondent	**Strongly Disagree**	**Disagree**	**Unsatisfied**	**Satisfied**	**Agree**	**Strongly Agree**	**Total**
Employer	0%	12.5%	18.8%	43.8%	12.5%	12.5%	100%
Student	0.7%	0.7%	10%	32.0%	35.3%	21.2%	100%

Table 4.65 shows that the response to the statement that industrial training has improved their skills in formal and informal written communication. 35.3% of student respondents agreed as did 12.5% of employers. 32% of student respondents were satisfied with the statement and 43.8% of employers were also satisfied. A slight majority of 21.2% students strongly agree and 10% were unsatisfied with it. On the employer side, only 12.5% strongly agree and 18.8% were unsatisfied with the written skills. Students, who strongly disagree and disagree, were at 0.7% for this evaluation. As for the employers 12.5% disagree that the industrial training had improved the trainee's skills in formal and informal written communication.

Table 4.66: Relationship that the industrial training has helped me/trainee's to develop the ability to socialize at all levels and maintain the relationship

Respondent	Strongly Disagree	Disagree	Unsatisfied	Satisfied	Agree	Strongly Agree	Total
Employer	0%	12.5%	18.8%	43.8%	12.5%	12.5%	100%
Student	0.4%	0.4%	5.6%	21.6%	43.5%	28.6%	100%

Table 4.66 presents the responses to whether or not the industrial training had helped engineering undergraduates develop their ability to socialize at all levels and maintain the relationships. It shows that 43.5% of student respondents agree, this is supported by 12.5% of employers. 28.6% of student respondents strongly agree and

12.5% of employers strongly agree. 21.6% of student respondents were satisfied and 43.8% of employers were satisfied. 5.6% of students who were unsatisfied and those who strongly disagree and disagree both yielded 0.4%. 18.8% of employers were unsatisfied and 12.5% disagreed with the matter.

Table 4.67: Relationship that the industrial training has helped me/trainee's to develop the ability to work effectively with different groups

Respondent	Strongly Disagree	Disagree	Unsatisfied	Satisfied	Agree	Strongly Agree	Total
Employer	0%	0%	12.5%	18.8%	43.8%	25.0%	100%
Student	0.4%	0%	6.7%	21.6%	43.1%	28.3%	100%

Most of the engineering undergraduates 43.1% in Table 4.67, agreed that the industrial training had helped them to develop their ability to work effectively with different groups. This is supported by 43.8% employers agreeing with the matter. 28.3% of students strongly agree, similar to 25% employers of who strongly agree and 21.6% of students who were satisfied, with 18.8% of the employers supporting the view. 6.7% of student respondents were unsatisfied and 0.4% of student respondent strongly disagreed with it.

Table 4.68: Relationship that the industrial training has helped me/trainee's to develop the ability to plan and complete any project given

Respondent	Strongly Disagree	Disagree	Unsatisfied	Satisfied	Agree	Strongly Agree	Total
Employer	0%	0%	18.8%	31.3%	37.5%	12.5%	100%
Student	1.5%	0.4%	8.2%	23.8%	38.7%	27.5%	100%

Table 4.68 shows the response to the statement that industrial training had helped them to develop their ability to plan and complete any project given, 38.7% agreed,

supported by 37.5% the employers of who agreed and 27.5% of student respondents who strongly agreed with it while 12.5% of the employers strongly agreed. 23.8% of the students were satisfied with it and this is supported by 31.3% of the employers being satisfied, while 8.2% of the student respondents were unsatisfied, and 18.8% of the employers were unsatisfied with the matter. The result of the student respondents' shows that 1.5% strongly disagreed and only 0.4% disagreed with the statement.

Table 4.69: Relationship that the industrial training has helped me/trainee's to develop the ability to identify problems, analyze and solve them

Respondent	Strongly Disagree	Disagree	Unsatisfied	Satisfied	Agree	Strongly Agree	Total
Employer	0%	18.8%	12.5%	43.8%	12.5%	12.5%	100%
Student	0.7%	0.7%	5.9%	27.9%	37.5%	27.1%	100%

In Table 4.69, 37.5% of students agreed that the industrial training had helped them develop their ability to identify problems, analyze and solve them, whilst only 12.5% of employers agreed. 27.9% of students were satisfied and supported by 43.8% of employers with a similar opinion. This is followed by 27.1% of students who strongly agreed with it and 12.5% of employers who strongly agreed with the matter. There are also unsatisfied student respondents 5.9% and for the employers this shows 12.5%, 0.7% of students are recorded under both strongly disagreed and disagreed, respectively. 18.8% of the employers disagreed on the statement.

4.12 Discussion.

The engineering student frequency tables (Table 4.7 to Table 4.17) of the GTQ relating to programme evaluation illustrates that generally the highest scores are in the agree columns (Table 4.7, 4.10, 4.14, 4.15, 4.16, 4.17). The second highest scores are in the satisfied column (Table 4.8, 4.9, 4.11and 4.12). Table 4.13 showed a similar amount of respondent (33.5%) in the satisfied and agree columns that the programme has improved their skills in formal and informal written communication. This gives us a view that the students agree that the programme they took equipped them with the generic skills they required for their future employment.

The overall evaluation in the GTQ of industrial training (Table 4.18 to Table 28) shows that most students agree that employers have equipped them with generic skills during their industrial training. This is supported by the highest scores being in the agree columns (Table 4.18, Table 4.19, Table 4.20, Table 4.21, Table 4.22, Table 4.23, Table 4.24, Table 4.25, Table 4.26, and Table 4.27). The second highest scores are in the strongly agree columns (Table 4.18, Table 4.21, Table 4.22, Table 4.23, Table 4.25, Table 4.26, and Table 4.27). Only a few (Table 4.18, Table 4.21, Table 4.22, Table 4.23, Table 4.25, Table 4.26 and Table 4.27) are in the satisfied columns. This demonstrates strong support for the work done (interpersonal and enterprise skills transferred) by the employer of the engineering student during their industrial training. Thus, this can present a contradiction to the statement by the researcher at earlier stage of this study that employers did not deliver a quality industrial training.

The engineering student GTQ on university life and co-curriculum activity (Table 4.29 to Table 4.39) shows that the highest scores are in the agree column. The next highest scores are in the satisfied column (Table 4.29, Table 4.31, Table 4.32, Table 4.34, Table 4.36, Table 4.37, Table 4.38 and Table 4.39). Therefore, the students generally agree that the university life and co-curriculum activity has developed and given them the interpersonal and enterprise skills that they require for future employment.

Most of the employers highest scores (Table 4.48, Table 4.49, Table 4.50, Table 4.51, Table 4.52, Table 4.53, Table 4.54 and Table 4.57) are in the satisfied column with others in the agree columns (Table 4.55, Table 4.56 and Table 4.58). The employers are satisfied with the average generic skills delivered to the student and the skills are appropriate to the work place requirement.

For all the employer and student frequency results, the tables (Table 4.59 to Table 4.69) show most of the students have gained some knowledge of interpersonal and enterprise skills demonstrated by the high scores towards the right of every table. The employers have also shown that they have delivered the generic skills to the students during their industrial training. This is indicated in the high scores in the right section of the tables discussed above. Therefore, the students assumed that they had received a very good foundation of the interpersonal and enterprise skills required for work place, while the employers also assumed that they had delivered a quality industrial training regarding the interpersonal and enterprise skills development.

Six-point Likert scales were used in this study to avoid the regular behaviour by respondents who like to choose the middle option if they are given five choices. Therefore, giving a six-point scale avoids this behaviour. This could give a more natural situation to what is happening in the population studied. The data analysis actually revealed that the highest response from the respondents is in the middle scale between scales 4 and 5. This is supported by the mean frequency (Appendix 6). Therefore, the researcher deduced that it is not in the nature of respondents to choose the middle scale but it is a reflection of an actual situation in the population.

The Explanatory Factor Analysis (EFA) is a multivariate statistical method used for a wide variety of purposes. This includes revealing patterns of interrelationships amongst variables. It also detects clusters of variables, each of which contains variables that are strongly intercorrelated and hence somewhat redundant (Appendix 7). This was illustrated in the second run of the EFA (Table 43), where most of unrelated variables are removed. The method also reduces a large number of variables (33 variables) to a smaller number (4 factors) of statistically uncorrelated variables, the factors of factor analysis that is each linearly related to the original variables. Therefore, with these techniques the researcher confirmed that the engineering student questionnaire construct and its high reliability result (Cronbach Alpha :0.955) shows this study's methodology was valid and reliable.

4.13 Summary.

This chapter presents the generic skills analysis in terms of measuring interpersonal skills and enterprise skills through a GTQ instrument. This study has used the descriptive analysis; utilized frequency and percentage as an analysis to learn the respondents' response pattern. The researcher has found that the pattern of both students and employers respondent shows positive relationship.

The researcher also used the Exploratory Factor Analysis (EFA) to measure the questionnaire constructs. This is to identify whether the researcher has measure the right item or issue. The high score from the results shows that the researcher has measured the proper item studied. EFA also reduced large variable to few factors and eliminate over lap item in the questionnaire construct. This helps the researcher to be focus on the measure construct. High score from EFA confirm the validity and reliability of methodology chosen.

Based on this situation, this chapter has looked into the quantitative analysis of the employer and the engineering undergraduates questionnaires. It seems that both the employer and the students are supporting each other based from the frequency and percentage analysis. The EFA results strengthen the study with validity and reliability in the construct measure. Is this result consistent or is there any contradiction between these results if other methods were used? The next chapter will explore on the interpretation of qualitative methodology.

CHAPTER 5

QUALITATIVE INTERPRETATION AND TRAINGULATION

5.0 Overview

This chapter presents the second issue of the proposed methodology that is the qualitative interpretation and triangulation for the establishment of interpersonal and enterprise skills towards employability amongst engineering students. It starts with an open-ended interpretation to determine the absolute value gain by engineering students, as stated in chapter 4, of interpersonal skills and enterprise skills transferred from the programme offered, industrial training and co-curriculum and university life. It is followed by the interview interpretation from the engineering students and the employers.

The aim of this methodology is to assist higher education institutions, practitioners, employers and also related individuals to measure the interpersonal and enterprise skills competencies amongst students, employees and trainees in order to tackle part of the employability problem. Based on that performance, higher education institutions, practitioners and employers can make a decision whether the courses provided have achieved their objectives or if they have given a positive reflection of course or training content provided. This helps promote interpersonal skills and enterprise skills towards employability.

This research question concerns the meaning of a phenomenon eliciting the essence of experiences. The method that best answers the question is phenomenology (Bergum,1991; Giorgi, 1970 and van Manen, 1984, 1990). Therefore, the result of this method would be in-depth reflective description of the experience of undergraduate engineers in developing their interpersonal and enterprise skills throughout their programme, industrial training and university life and co-curriculum activity. The employer data would reflect the experience of the employers, developing the undergraduate engineers during the industrial training.

5.1 Sample

The population under study has been chosen through stratified random sampling from 4 universities in Malaysia; 2 are from government public universities and 2 are from private universities. In the first set of investigations the researcher conducted the survey (refer to chapter 4) with 269 samples. For convenience (Lincoln & Guba, 1985), the researcher chose 8 respondents from the undergraduate engineering samples (4 respondents from the government universities and 4 respondents from private universities) from the sample and 2 respondents from the 16 employer respondents for the interview method. According to Denzin, (1994) the sample size for in-depth conversation is approximately six participants. In grounded theory, one sample event and incidents are indicative of theoretically relevant concepts. Persons, sites, and documents simply provide the means to obtain those data (Strauss and Corbin, 1990). According to Potter (1996) under the qualitative approach, agreed that the issue of sampling is concerned more with gaining access to relevant evidence about the phenomenon. Therefore, the two key words in this concern are access, which reflects a practical concern and relevant, which reflects a validity concern.

5.2 Research design

The tool design in this part of the study was an open ended questionnaire which was distributed through the Generic Transfer Questionnaire (GTQ). The GTQ set for the engineering undergraduate respondents is divided into 4 sections; section A is the respondents' demography, section B is the evaluation of the GTQ embedded in the programme module, section C is the evaluation of the GTQ in industrial training and section D is the evaluation of the GTQ of university life and co-curriculum activity. At the end of section D there was an open ended question. It deals with questions regarding most valuable session, least valuable session and comments.

The employer set of questionnaires have 3 sections; section A is the employer's demography, section B is the GTQ of industrial training evaluation and section C is the ranking of generic skills importance. At the end of section C, there were 3 open ended questions regarding the most valuable session of industrial training, least valuable session and comments.

The second tool used in this study was an in-depth interview for both the employer and engineering undergraduate respondents. Interviewing is undoubtedly the most widely applied technique for conducting systematic social inquiry. Sociologists, psychologists, anthropologists, psychiatrists, clinicians, administrators, politicians and pollsters treat interviews as their 'window on the world' (Hyman, et.al. 1975). Looking at more methodical forms of information collection, it has been estimated that 90 % of all social science investigations use interviews in one way or another (Briggs, 1986). Both results, from the open ended questionnaire and interview, were interpreted and triangulated.

5.3 Ethics- codes and consent

One significant element of ethical research codes is the concept of "informed consent", by which the subjects of research have the right to be informed that they are being researched and also about the nature of the research (Denzin & Lincoln, 1994). According to Weppner (1977) "that the potential research subject understand the intention of the research and sign an 'informed consent' form, which incidentally must specify that the subject may withdraw from the research project at any time". Therefore, the researcher distributed the letter of consent to the respondents attached on the first page of the GTQ survey questionnaire. In return, the researcher would not reveal any names of the institutions, individuals or companies that participated in the study. All the respondents names, institutions and companies involved in this study have been changed to another code that would not reveal the first party.

5.4 Student data presentation-open ended data

5.4.1. Evaluation of generic skills embedded in programme modules

An evaluation of generic skills embedded in programme modules illustrates the response from engineering undergraduates regarding their most valuable session in their programme modules. Respondents were asked questions regarding the most valuable session throughout the programme modules. There are varieties of responses which can be summarised into 9 themes/categories as shown in Table 5.1, Evaluation of generic skills embedded in programme modules by themes. These are communication, industrial training, engineering subject, humanities subject, hands-on, generic skills, language, seminar and all important. The highest score is 22.99% in communication. The researcher deliberately took out communication from the generic skills themes because the percentage scores are so high compared to the other generic skills score. The respondents under the communication theme agree that this was the most valuable session throughout the programme module. Typically, the respondents wrote that their most valuable session was…

Respondent UA55: "communication skills because easy to communicate and understand people".

Respondent UB131: "there was once I joined a committee to organize a seminar.
I was in-charge of arranging food and finding sponsor.
Here I learned how to communicate different kind and rank of people…"

Respondent UC165: "I was able to improve my communication skills and socialize"

Respondent UD238: "human communication because it is important to maintain relationship throughout the years in employment"

Table 5.1: Summary of evaluation on generic skills embedded in programme modules by themes

	Most Valuable	Least Valuable	Comments
Communication	22.99	2.86	11.11
Industrial training	18.38	13.33	16.67
Engineering subject	17.25	9.52	7.4
Humanities subject	6.9	30.48	24.07
Hands-on	8.06	23.81	16.67
Other Generic skills	14.37	5.7	1.85
Language	8.05	3.81	3.7
Seminar	2.29	2.86	11.12
All important	1.72	7.63	7.41

This is followed by the industrial training theme with 18.38%. The students found that the industrial training was valuable; applying the university's knowledge to industrial training is valuable. Being able to complete any project or going for site visits and monitoring projects is valuable. The respondents also appreciate it when they learn new things and develop knowledge. Examples:

Respondent UA49: "the most valuable session in my program for Employability skill is practical training. It's because student can know how engineer works in working environment".

Respondent UB81: "most valuable session is adequate industry-needed expertise are taught such as automation, precision control and etc".

Respondent UC172: "industrial training because it tells us the outside life of working".

Respondent UD221: "learn & experience how an engineer's working life is. Get to know what can I do to prepare for the working environment".

Thirdly, were the engineering subjects with 17.25%. In the engineering subject themes, the respondents value their manufacturing subject, design, mathematics, mechanics or materials, thermo dynamics, fluids mechanics, technical terms, quality optoelectronics and in software subjects such as AutoCAD, MSCPatran, MSCNastran or programming. Examples:

Respondent UA27: "Manufacturing FJP556 and production. Because in this subject I has been learn a lot of process and technique which give me some ideas and knowledge in order to a apply in work area".

Respondent UB89: "Learning new knowledge about quality, industrial engineering because some of the subject or knowledge are quite up to date so it may useful when working in the future".

Respondent UC150: "Programming language and some practical/lab"

Respondent UD222: "Learning of commercial software like Pro-E, AutoCAD, CFD -experience in tooling shop"

This is followed by other generic skills themes with 14.37 %. The respondents value the generic skills transferred which improve creativity ability, problem solving, analytical skills, group work and team work. Examples:

> Respondent UA36: "All subjects and co-curriculum activities in university. I had be taught to understand and able to solve the problem".

> Respondent UB87: "Grouping work-learn how to communicate to others, giving items and completed the task given".

> Respondent UC173: "Final year project because we not only learn but also we need to do studies and solve problem so that the project will success"

> Respondent UD195: "Working in groups/teams to complete mini-projects. Researching and doing my final year project"

Table 5.1 also demonstrates the least valuable sessions regarded by the respondents. The highest score 30.48% was for the humanities subjects. The respondents found that humanities subjects were least valuable to them. The subjects are Islamic civilization, Malaysian history, nationhood, statistics, whilst content around management skills was not covered in detail. They thought that the humanities subjects do not relate to the engineering field while other engineering related subject worth studying but in less content. Examples:

> Respondent UA25: "*TITAS* (Islamic Civilization)-the subject did not have anything to do with engineering".

> Respondent UB101: "General subject like *TITAS*(Islamic Civilization) and *Kenegaraan* (Nationhood) because there are no correlation in engineering field".

> Respondent UC149: "Some of the subject such as Malaysian studies. Not Much use and employer won't consider that option".

Respondent UD191: “Liberal arts subject such as history, etc. contributes very little for employability skills”.

The second least valuable score was the hands-on theme with 23.81%. In this theme the respondents complain that most subjects or modules have less practical work, lots of theory that they do not understand, outdated syllabus, exam oriented, and a lecturer with no experience and an attitude problem. Examples:

Respondent UA33: “maybe theory subject is so bored”.

Respondent UB85: “Some lecture is quite boring and the students will feel sleepy because doesn’t has the involvement of students. This lecturer is only a “lecturer” not a “teacher””.

Respondent UC150: “Truly speaking the program is exam-oriented”.

Respondent UD215: “Too much theory. Need to have some practical exposure”.

The third score 13.33% in Table 5.1 for the least valuable session is industrial training. Here the respondents identify the least valuable session in industrial training while doing the project; quoting limited time, actual work but being a student without work experience, some received inappropriate jobs or tasks, non-productive working hours for example they can give workers a lift home because they own a car. Others do unskilled jobs which they regard as not important and doing once a week-training programme. These are the arguments and causes of the least valuable issue during their programme module. Example:

Respondent UA48: “Doing out of my job scope. It happens because there is nobody for that work/task”.

Respondent UB115: “When I followed other technicians to make reading meters, because I got bored and there’s not many work to do".

Respondent UD235: "Non-productive working hours because trainees are not able to participate through all the works carried out".

There are lots of comments or recommendations given by the respondents. The highest score 24.07% in the humanities subject. Their comments are focussed on non-core subjects such as the content is too shallow i.e. in drawing and financial management. The students wanted to abolish unrelated subject to engineering such as humanities modules. The students wanted the exam oriented programme to be changed into a less stressful programme. The student's are aware of employability skills and suggested that employability skills should be in every subject. They also wanted a balanced syllabus rather than lots of theory that did not help in industrial training and a review of the syllabus should be done after 4 or 5 years. This is to evaluate and check the content is up-to-date with the market needs. Example:

Respondent UA22: "Increase the time period for training since one and a half month is not enough. Ensure that students that have fulfilled a certain limit of credits only is allowed to go through the training to prevent misuse of the training programme".

Respondent UB 80: "The programme needs to re-check and re-look at the syllabus. In UB, so many subjects need to be taken by the student. The un-related subjects also need to be taken".

Respondent UC173: "Abolish some LAN (National Accreditation Board) subject or lower/decrease the fee"

Respondent UD202: "Ministry of education should remove subjects which are not related to real-life situations"

Industrial training and the hands-on themes have the same score of 16.67% and are rated second. The engineering undergraduates suggested the industrial training should be in the last semester and the syllabus of the industrial training should be expanded. The students hope that they could be employed after industrial training and the students need more practical training. The students commented that they would like to see a balance between theory and practical exposure. The students wanted less credit hours per semester, more laboratory and hands-on activity. They suggested providing illustrations on all laboratory components and tools. Examples:

> Respondent UA23: "I hope that next time; you will provide a course that needs a lab/practical session".
>
> Respondent UB93: "Enhance hand-on practice, lab works, more technical practice besides studies"
>
> Respondent UC172: "Increase the duration for industry training"
>
> Respondent UD210: "More hands-on training on the real thing"

The third scores are of 11.12% for seminar and 11.11% for communication themes. The students suggested the co-curriculum content should be a module and made compulsory. The students wanted more engineering conferences and seminars. The students are aware that degree++ (extra courses related to employability during the term break) help in employment. The students in the communication themes commented that they want an increase in student/educator communication, performance and knowledge transfer. Examples:

> Respondent UA49: "Add more conference about engineering in faculty especially about the new technology that happen now"
>
> Respondent UB79: "Give many opportunities to students to join the seminars, international forums inside and outside the country to gain much knowledge possible".
>
> Respondent UB103: "The lecturer should encourage their student to talk in front of class to make them brave to give opinion and more confidents to face anyone"

Respondent UD229: “Trainees have to be more social with the other workers and maintain good relationship. Gain as much work experience whether it is good or bad”

5.4.2 Evaluation of generic skills transfer in industrial training

Table 5.2 demonstrates the evaluation of industrial training quality and generic skills transferred to engineering undergraduate respondents. Table 5.2 consists of task appropriateness where students should answer yes or no indicating whether or not the respondents have received an appropriate job and task. In the column for training period length the query is whether or not the training period is enough for the respondent. The respondent either answers yes or no. The last column requires comments on the quality and interpersonal and enterprise skills.

Table 5.2: Evaluation of generic skills transfer in industrial training

Task Appropriateness	%	Training period/length	%	comments	%
Yes	77.8	Yes	30.27	Placement quality	59.37
No	22.13	No	69.73	Interpersonal and enterprise skills	40.63

77.87% of respondents answered yes for task appropriateness. They elaborate their comments as to the need for the latest information; the respondents need more time to apply the fundamentals learned, and they noticed there is half related experience. The researcher assumes that these maybe this refers to tasks related to non-engineering such as documentation work. 22.13% answered no to task appropriateness. Their comments are the exposure experienced was not related to their field such as electrical and electronic devices, web design, commercial, aircraft window refurbishing, basic drawing, non-engineering departments, technician, and documentation job. There are respondents that have not done industrial training because it is not compulsory. Examples:

> Respondent UA44: "The task given based on kanban observation, documenting, labeling parts and do the office work. The task more on management and I was placed under non-engineering department, which is material planning & logistics".
>
> Respondent UB110: "Yes. Is relate academic requirement but the different is more to the latest information learning".
>
> Respondent UC185: "No, the tasks given were not engineering related, it was more on commercial"
>
> Respondent UD196: "No. I was only asked to visit sites and read manuals/technical reports".

69.73% answered no to the appropriateness of the length of the training period. The respondents comment that they had not enough time to digest and reflect the knowledge and experience received during industrial training. 30.5% answered yes the length of training is appropriate. 59.37% commented on placement quality. The respondents describe that they need a longer period of practical or industrial training of at least one semester. They need more real life projects. The respondents suggested the industrial training should be done during the semester, not in the semester break. It is difficult to relate practical training and theory in a short time. Therefore, students should be given more time to apply their knowledge. Extra courses named degree ++ could contribute to employment. The respondents suggested that they would like to be involved in any programme conducted by industry i.e. to maintain a two way relationship between universities and industries, involve trainees in any project, give trainees a chance to solve problems, provide good modules for industrial training, proper reports, proper engineering supervisors not technicians, specific industrial training objectives, a mentor and effective learning; the trainee should be given a chance to choose a suitable company and work in industry. Examples:

> Respondent UA17: "Not enough due to limited time given. It takes time for me to adapt the working environment beside there's a lot of thing I need to learn"
>
> Respondent UB74: "Not really because industrial training is only done during the semester break so we will only be there per a maximum 2-3 months only. Not enough time to gain experience".
>
> Respondent UC169: "No. too short, gain less working experience".
>
> Respondent UD200: "No because the time limit is too little (12 weeks) which is just enough to get introduced to all tasks or part of the tasks".

40.63% of commented on interpersonal and enterprise skills were concerned to allow students work together with industry staff. The respondents wanted a communication flow at all levels. Industries should give a chance to the respondents to voice opinions. Whilst, the industrial staffs share their experiences of working with external vendors, clients in presentations and meetings, this was not so for the students. The respondents were aware that to be employed, they must be independent, be proactive in obtaining required skills, have high self confidence, have working experience, work on their own initiative. The respondents suggested having lots of seminars by invited speakers from industry. They also suggested managing some events or group/teamwork activity to develop interpersonal and enterprise skills. This cannot be separated from continuous development and life-long learning and training and co-curriculum activities. Examples:

Respondent UA24: "Be familiar to practical training. Always have continue practical training if have a long semester break".

Respondent UB81: "The best way to transfer generic skills is by seminar, training and reward for displaying generic skills attitude in working time".

Respondent UC151: "Implement some company project".

Respondent UD196: "Trainee is invited to join meetings projects, conventions in that particular organization".

5.4.3 Evaluation of university life and co-curriculum activities

In this section (refer to Table 5.3), respondents were asked to evaluate what was the most valuable session, what was the least valuable and for their comments regarding their university life and co-curriculum activities. There are 11 themes; namely co-curriculum, communication, subject, industrial training, knowledge, team work, seminar, other generic skills, project, problem solving and language.

Table 5.3: Summary Themes of Evaluation on University life and activities

	Most Valuable Session	Least Valuable Session
Co-curriculum	21.86	18.92
Communication	19.38	9.46
Subject	5	12.16
Industrial Training	6.25	17.57
Knowledge	5	2.71
Teamwork	5.63	4.05
Seminar	10.63	2.7
Other Generic skills	3.12	5.41
Project	15	13.52
Problem Solving	6.88	9.45
Language	1.25	4.05

The highest score 21.86% falls under co-curriculum (club, societies) activities as the most valuable session throughout the university life. The second was communication at 19.38%. The students found that communication skills/public speaking/presentation/socialize/dealing with all levels of people are valuable. The third score 15% is for the project. The students found that the most valuable sessions are the final project/lab/assignment/final year/studying/ Degree ++ and short courses during their university life and co-curriculum activity. Examples:

> Respondent UA 28: "Extra co-curriculum-help to develop social activities and self confident-seminar".
>
> Respondent UB95: "When I was a choir club member. There, I learned how to handle a group of member and how to run or organized an activities".
>
> Respondent UC163: "I have the knowledge not only related in the field that I am doing, furthermore, I gain knowledge from my co-curriculum activities as well".
>
> Respondent UD196: "I joined entrepreneur club/SIFE (students in free enterprise). I had a chance to undergo business internship initiative program in USA. It improved my communication skills as well as my consciousness towards the outside world"

In the least valuable session column in Table 5.3, co-curriculum activity got the highest score of 18.92%. The comments on the least valuable session under co-curriculum activities are; not interested in club/organization/concert and have limited budget for student activities. The second highest score 17.57% was industrial training. The students comment that hands-on training is not enough, there is a lack of practical sessions, there is too much emphasis on theory and practical training time is limited. Example:

> Respondent UA45: "Less activity held by students due to small budget by the administrator and HEP (Department of Student Affairs)"
>
> Respondent UB84: "Some irrelevant humanities subjects. This is due to lack of enthusiasm from the academic staff which in turn raised the question of its relevance…"
>
> Respondent UC132: "Practical training because just 10 weeks".

Respondent UD221: "In university, we just exposed to knowledge. We lack of communication skills, social skills & management skill".

The third high score was the project theme with 13.52%. The students commented that the least valuable session is system dynamics, as it is a tough subject from 1st yr to 4th year, it is exam oriented, it appears as system vs value and is spoon-fed.

The highest score of 20.38% in the student comment column falls under seminar. The second highest score 20.37% is the industrial training. Both of this score are virtually 20.4%. Therefore the researcher considers this as same category in the highest score. The respondents commented on the need for more activities with outside people such as the community or charity work. There should also be lots of international forums and career path presentations plotted out for students to attend. The respondents emphasised the need for more practical training than theory; more hands-on experience, real life projects, industrially based programmes and classes. The appropriate industrial training slot is during semester break. 16.68% suggested that co-curriculum activities should train to help balance work and study. They also suggested raising the budget for co-curriculum activities and that it must be made compulsory.

5.5 Student interview result.

The interview session involved 8 students from the 4 universities under study. The students were asked questions relatively similar to those that they have already answered in the survey. This is to elaborate on what the student feels of their experience throughout the university programme, the industrial training and university life and co-curriculum activity. Every student is given 9 questions to answer within half an hour (refer to appendix 4a). The first two questions are related to their plans after graduating and what is their approach to be employed. Most of the respondents mentioned that they will look for a job. They would try to look at the advertisements in the newspapers, internet or walk-in interviews or through their networking during industrial training. If they can not get a job, they would prefer to further their studies or just keep applying for the appropriate job.

Other questions are as in Appendix 4b, the student interview results. For the question of what was the most valuable session throughout their university life that will help them to gain employment, 37.5% of the respondents agree that industrial training helps build their employability skills and the same percentage agrees that co-curriculum activity helps in developing personal skills or generic skills. Only 12.5% claimed the final year project as the most valuable session.

Most (75%) of the students in the interview identified the programme offered as meeting the job market requirement. Nevertheless they did argue that some modules do not have up to date content (software related) or no usage of programming skills in project management. Only 25% responded that the programme offered is too exam oriented and there are insufficient practical sessions.

A further question asked if the industrial training helps to build employability skills. All (100%) of the respondents agreed that industrial training has helped them in building their employability skills. Overall, 100% of the respondents agree that interpersonal skills and enterprise skills are important for employability.

The respondents gave the following comments; that the university should introduce interpersonal and enterprise skills so that students are not shy to communicate and the university should have grooming classes for social interaction. At a company level, there must be more relationships with universities and at a student level they should make themselves more marketable. Employers must restrict taking only experienced people. Employers should also ensure that there is a safe working environment for female engineers during the night. The students remarked that engineering programmes in Malaysia should be specialized, as currently it is too general. The respondents all agreed that the industrial training period should extend to 6 months.

Industry in Malaysia reflects the need for engineering specialists and engineers are in demand. A few do think as an engineer you could not be jobless. The education system is exam oriented and there is a hope that one day the education system will be more balanced between theory and practice and finally the university should provide more practical sessions.

5.6 Employer open ended data presentation

5.6.1. Generic skills embedded in industrial training module

16 employers responded to the questionnaires distributed through
e-mail, and fax. The companies are involved in various operations such as semiconductor manufacture, aircraft maintenance and service, manufacturing, oil

business, tunnel construction, housing development, electronic manufacturing, pressure gauge manufacturing, automation and control solutions and industrial processes such as electrical power generation, sea port container handling, automotive industries, and fertilizer manufacturer.

Appendix 8 consists of table of generic skills scale embedded in employer industrial training illustrates the employer feedback regarding the most valuable sessions throughout the industrial training. The respondents highlight familiarization and mentorship programmes as their most valuable session with the trainees. The chance to deliver on the job training and exposure to the real life-working environment which is different to the classroom/lecture hall environment was also the most valuable sessions for the respondents. The industrial training exposure is aims to increase self confidence, new knowledge about the industrial process and improve social communication with peoples. In return, the company gets additional help. Trainees should take the opportunity by using the existing resources provided and the chance to learn from experienced engineers. Trainees can have hands-on learning by actually doing and learning from their mistakes. They then can use the theory learned and apply this to the actual performance of allocated tasks and the experience of working on site i.e. shop floor. This can be summarized into a few themes/categories namely new knowledge, socializing and developing relationships, hands-on, real life work and self confidence.

The employers responded that the least valuable session throughout the industrial training was that trainees take a longer period to accommodate in his/her industrial familiarization programme. The employers considered that the student should be able to give ideas or feedback to the organization to which they were attached in terms of suggestions for improvement and this help to create an innovative mind that a future leader will need, however the percentage showing this is low. The employers also expect that the trainees become actively, involved in team work by working with and questioning maintenance groups. The attitude of the trainees and their willingness to work together during the training session should be improved. Employers do not need lay back trainees as their employee; therefore trainees should have a positive attitude and willingness to work hard to gain knowledge and skills. The employers' advice is that trainees must see themselves as real graduate engineers and they should be accountable for the expected/desired deliverables. Industry cannot allow a student to be a block to normal work happening because that would lead to high costs in admin, manufacture etc. The employers suggested that trainees with knowledge of problem solving in real situations and the ability to analyse the results would be an advantage. This column can be summarized into a few themes/categories such as familiarization period, team work, trainee attitude, accountability, and problem solving skills.

The final open ended question was seeking comments regarding generic skills transfer. The training modules were not meant for industrial training trainees but it was aim to staff training and development. The employers appreciate it if the immediate university industrial training supervisor can assess their student's generic competencies and the detail should then be used as a part of the application that is used by the organization to which they will be attached. This could smooth the process of the trainee's insertion into a placement in industry according to where their skills best fit. This will encourage the student starting directly from university life in to the organizations. Leadership capability is a vital skill for future engineers in industry. There are trainees who are not well prepared to adapt to the industrial environment and sometimes they appear a bit lost. Trainees should have an attitude of 'I-want-to-learn', and be aware of what is expected of them. Trainees must deliver the job at the given time and must speak and write in clear English. The employers believed the most suitable period for industrial training is about 5 to 6 months. This section can be summarized in a few themes which were the training module, access to student generic skills level at entry, leadership, preparation for industrial training, trainee attitude, effective communication and the length of training period.

5.7 Employers interview result.

Two companies volunteered for interview in this study, and they are the company AMSB, an aeronautical company and HMMSB, an automotive industry company.

AMSB has been in operation since 1985. Their representative was the manager of the Human Resource department. She has been responsible for arranging industrial training for almost 10 years. In a year they normally allocate a quota of twenty student/trainees. This is because the company gives an allowance to the trainees and they have to meet their budgets.

HMMSB has been in operation for four years. Their representative was also the manager of the Human Resource department. This company sets an allocation of 5 student/ trainees per year. The trainee numbers are low because the organization does not allocate a specific person to handle practical training. As a consequence the trainees may have difficulties in their placement activity and this may defeat the training objective if the trainees do not get a proper industrial training task.

This section displays the interview feedback by both the employer respondents. AMSB's response to the opinion of industrial training is that they feel responsible to accept students from universities to come to their company and also as a part of their contribution to the nation. While HMMSB's response was that it is very important to the student but for the employer it can be a burden if there is no proper system to monitor the training process of the student.

Both AMSB and HMMSB agree that the duration of industrial training ranges from 2 months to 5 months. The length of industrial training was fixed by the universities. AMSB does not agree on the duration because they feel that the majority of students who come to AMSB are not from an aeronautical background but are engineers, therefore, the 3 months period is simply not enough. Due to the infrastructure of the subject they are learning it is not sufficient for the student. As for HMMSB, the period is not an issue, but the student's initiative to learn is more important than having 6 months training but for the student to just sit and learn nothing valuable for employability.

As for the response to the question on the industry requirements from the engineering graduate, AMSB stated that they have a set of criteria called QTE (Qualification, Training and Experience), that are their basic requirements. These include a bachelor's degree in the area, for example, Mechanical Engineering majoring in aeronautics. Basic engineering software skills AutoCAD is also required and a few others in aeronautics. For a fresh graduate then basic training in aeronautics is a minimum requirement.

Experience in a related field, with Malaysia Airline System (MAS), or any aviation company is an advantage. Generic skills like a good command of English, good communication skills, technical English, being proactive and with good initiative and commitment towards the company are expected. As for HMMSB, the industrial training student is interviewed initially; the students are then short listed for training. During the interview, they actually assess the applicant's willingness to learn, by giving them a set of objectives.

Both companies were asked about the importance in recruiting engineers and whether the company has a practice to select on the basis of degree or generic skills. AMSB specified leadership quality; quoting they are looking for a dynamic kind of person, presentable as an aircraft engineer. The nature of engineers working at AMSB is that they are not doing one job but multi tasking. They are handling a number of projects at the same time, so they must have knowledge in project management. If they know about critical path analysis, they have an advantage because they are going to be better able to monitor the project. Problem solving and attending meetings are not required as much because they are fresh graduate engineers. They have their senior engineer as their superior, so they have their own boundaries. As for HMMSB the company normally looks at experience. For a fresh graduate, they normally prefer a Japanese speaker. If the applicant is not a Japanese speaker they consider the applicants other experience.

Both employers were asked whether the cause of unemployment amongst engineering graduates is because of a lack of interpersonal skills or enterprise skills. AMSB responded through her observations, that when they have been trained as a university graduate in what ever field, the problem in the Malaysian industries is on this basis:

i. There are not many aviation companies in Malaysia.

The sector is very small. After graduation, the students apply for a job in this field but the market is too small and then they are forced to accept jobs in other field perhaps in sales or administration. Therefore, there is a mismatch between jobs and the skills. Technical knowledge is then lost to the field and the country. Therefore, the cause is not that they do want to work but because the market is limited in the country.

ii. Lack of interpersonal skills.

The trainees have little participation in industrial training classes. They do not have confidence to give their opinion. She thought that they have lots of ideas but the level of confidence is low. AMSB thought that the trainees are not brave enough to speak or communicate in English.

iii. Enterprise skills.

The nature of learning and the working process of engineers is that they learn a lot of theory and they do practical work during their industrial training. They are used to the method or approach of learning. Therefore, when they are ready for work, they just follow the manual. The trainees are not daring to use the skills and knowledge they have learned in universities to apply or build something. Innovation and creativity is about building or creating something. According to AMSB there are two possibilities as to why this happens:

a) Maybe the market itself or its surroundings do not encourage. Therefore, the employees were not asked to design new projects or products. This would suggest that it is not their fault.
b) Small or limited job availability in this field means they may have to enter administrative work which is totally different from the original qualification in aeronautics. Therefore, they will not be exposed to enterprise skills in this field.

HMMSB quoted the lack of enterprise skill and also lack of practical knowledge as causes of unemployment among engineering graduates. There is evidence that the engineering graduates cannot apply the theory to the real work place. HMMSB suggested the engineering syllabus should have emphasis on the technical aspects and its applications as done in polytechnic colleges.

A further question was put to HMMSB that according to the researcher understands, the polytechnic produces Diploma holders for the technician level whereas the university produces graduates for supervising or managerial roles. These graduates should have some theoretical, practical and generic skill. The HMMSB responded that in their company they believe an engineer must start from the ground level. Although they employ a new engineer, the person will have to go through a lot of on the job training before they can be considered as an engineer.

For the question of priority or importance placed on generic skills in the company, AMSB gave a positive response. They have 2 sets of training; technical skills and soft skills. This is because they want the employee to acquire a balanced set of skills; especially the engineers. They want to optimise the career path of their engineers, therefore the generic skills are important to them. In AMSB they have two kinds of training:

i. technical skills; is a compilation of basic aircraft engineering.

ii. soft skills training; comprises of communication skills, leadership development, human value and generic competency.

So, if the students are employed in their company, they will be given maximum training in techniques about air legislation and basic engineering. They are also trained in the basic requirement of supervisory development skills; such as how to do planning, critical thinking, leadership, motivation skills, communication and how to write for business. For HMMSB, on the other hand, they treat the interpersonal skills through the process of team work. This basic training is different from what they learn in universities.

Both the respondents were asked the question whether the task given to the student in the industrial training was appropriate to employability and to academic requirements. She agrees it is very important and critical. Out of 20 trainees from industrial training, around 4 will be employed by AMSB. Normally, before the trainees leave AMSB, they will fill in the company employment form. The company feels that the practical training provided encouraged them to work with AMSB. Practical training provides very good trainees with a good reputation for prospective employers but the only disadvantage is that the duration is short. Most of the students who came to HMMSB did not use what they studied in the university. If they are a mechanical engineer and are inside the engineering department, they do more paper-work or research than doing the "real thing". At the end of the training session they are asked to write a report on the things they have learnt especially on the interpersonal skills, such as how to negotiate with bosses and how to get cooperation from their colleagues.

As to the response to suggestions of better ways of transferring employability skills to the engineering graduate, AMSB did discuss this with their CEO during the student's work experience. As a company and employer, they should provide a systematic module for the practical training that is standard for industrial training. They can then have a specific measurement tool that can be beneficial to the ministry of higher education. Their intention therefore was to design a standard module. Currently, they only do the scheduling and ensure trainees gain valuable work experience in the departments. Nonetheless they still feel that this is not sufficient as there is lack of regular communication. Their CEO suggested that they should come up with some module for industrial training. They will need some duration or time line to develop a standard module. If they have a certain module, they will only be able to offer the course to specific universities. This is because they want to correlate their modules with what they study at university. Once chosen, they have a standard module which relates to what they have studied at the particular university. This can be a better way in transferring data and close collaboration with the university. At HMMSB, trainees were asked to write a report of what they have learnt and achieved in the company. Normally, the response is positive. HMMSB suggested that when they come for industrial training, this company must appoint a mentor. Currently, although there is practical training in the HMMSB manager's department, there is no specific person to guide them. So it is still based on the initiative of the trainee to learn. He emphasised that practical training is of a second priority, the emphasis must be more on production. If the company's personnel are too busy with their work, they do not think about sacrificing their time to teach a trainee.

In response to a question on collaboration with the university regarding the industrial training, AMSB stated that the university should give a list of generic skills competencies of their students included in their CV. With this information the company can accurately assess the suitability of the trainees and define an appropriate project. The researcher found that it might be a problem if the measurement tool came from the university because it might be general. It would be wise, if employers could provide the categories they wanted to look at according to their needs. Therefore, industry and the university can look into this matter for further development.

Answering the same question, currently HMMSB collaborates with a Japanese University. They currently do not have collaboration with local universities. At a lower level of the company they have collaboration with Malaysian lower technical institutions, such as the National Vocational Training Council (MLVK) or Industrial Training Institute (ILP), but at engineer level they currently have no links. Normal practice in Japanese companies is to recruit engineers from Japanese universities.

With regard to the question to AMSB on the issue of lack of communication between the university and the company, their comments and suggestions regarding this matter are about when the university representatives make their visit to the company. AMSB reported that the university have several representatives to handle the trainee's issues during in industrial training and therefore, it causes a problem to the company when there was a problem, they wanted to solve it simply but find that they are passed from person to person. The administrative issues have to be transparent. The collaboration should happen in a more professional way. Rather than the university representative visiting the company, ask to see the students log book; acknowledge the trainee's task and industry supervisor and they can go on without consulting the industry. If there is anything they should discuss relating to issues in industrial training for the benefit of both parties they can meet. AMSB appreciate steps taken by one of the universities that once a year called them, held a forum with the administration, the lecturers, faculty and coordinators and they discuss issues for the benefit of industrial training. AMSB urged other universities to follow this step rather than communicate only through letters. Good relationships and collaboration between university and industry would be an advantage for the students in future training.

HMMSB chose the Japanese University because of a managerial decision. The Japanese universities have collaboration with H Company, Japan, therefore they appointed HMMSB as the venue for trainees.

As to the question to AMSB regarding literacy, the employer stated that they require good communication skills; i.e. not specifying whether it is oral or written skills. As for AMSB, they specified that out of 20 students they assess, they can all communicate in English. When asked to produce a report, a problem arose, they cannot write a report. The inability to speak and communicate in English is in direct correlation with their inability to write in English. The trainees cannot produce a report, and industry has to teach them. The trainees explained that they have not learnt that in university. As the employer, AMSB could not believe this to be true. The researcher's personal experience as a lecturer suggests that the trainees have been exposed to report writing format before they went for their industrial training but they may have forgotten it. AMSB reported that out of 20 students, only 4 have difficulties in this. AMSB commented that in industry the English language is very important. This is because aircraft technical manual are written in English and therefore, if the student lack ability in English language, they will have problem.

On the question of the future needs of industry, AMSB mentioned that future needs in aeronautics are very demanding. They have a deficiency to start a project in the Subang area. Towards the year 2010, Malaysia will be facing a problem because of the loss expertise in this field either they work in other country or they have left the field for other job options. As for HMMSB, the trainees need to know how to promote themselves. Sometimes it is unfair for a student with very high CGPA taking 20 minutes in an interview to convince the interviewer to recruit him/her as an engineer. They must know how to present and how to sell themselves. HMMSB stresses the need for soft skills besides the good academic grades. They should prepare themselves before interview especially their objectives for the interview.

Further question to AMSB regarding the issue of why, they feel that the market was limited, when the university is producing lots of engineers. According to AMSB, the market was limited previously and that caused aeronautic engineers to go into other fields such as manufacturing, pharmaceutical etc. Then, when they wanted to start the Malaysia Airline System (MAS), at Subang airport, the manpower needed was around 12,000 staff in aeronautics but Malaysia did not have enough manpower. They then realized the deficiency of aeronautic engineers. The government are tapping engineering graduates of 5 years ago, who have opted for other companies or fields. This relates to AMSB earlier mentioned difficulties of enterprise skills in aeronautics because all the related engineers are in jobs not in their field i.e as a teacher.

Both respondents when asked for other comments regarding employability they would like to added the following:

i. universities should be proactive in order to collaborate with companies.

ii. universities have to look at the needs of industry, when they want to produce more graduates they have to take into consideration the future.

iii. in engineering, English communication is compulsory regardless of race. Trainees/employees must be fluent in English. Companies cannot help them but the university must assist them either in grammar or other aspects. Then they can come to industry and gain all the knowledge on offer to industry.

HMMSB added no further comments.

5.8 Triangulation

5.8.1 Engineering undergraduate respondents

There are two results from the student data which is the open ended data and the interview data. This section will investigate if there are any correlations, similarities or differences between the data using a triangulation method. These are the themes used to see the difference between the two sets of data; programme evaluation, industrial training and university life and co-curriculum. The data set out below are the summary from the real data (sections 5.2 and 5.3) with a triangulation method applied to seek out any correlation or any relationships in the data.

5.8.1.1 University programme evaluation.

For the open ended data, it has been identified that communication (22.99%), industrial training (18.38%) and engineering subject (17.25%) are rated to be the most valuable to the student respondents.

From the interview data, 37.5 % agree that industrial training and co-curriculum activities were the most valuable sessions in helping them gain employment while, 12.5% highlighted the final year project.

Comments by the respondents:

In both sessions, respondents wanted the industrial training period to be extended from 12 weeks to 6 months. They need the time to learn all the new knowledge sets from industry and try to transfer the knowledge they learned at the university to industry. Therefore, with quality time they can learn many things in the working environment.

Researcher comment:

The above data revealed that there is a correlation between the open ended data and the interview data. The data are supporting each other by which the student found that industrial training was the most valuable session, where as in interview the student still found that industrial training was the most valuable session to help them gain employment. Therefore, there is a positive relationship between the open ended data and the interview data.

Meanwhile, co-curriculum activity has a similar response to the communication themes in open ended data. There is no doubt that students actively communicate in co-curriculum activities. Therefore, there is a correlation between communication and co-curriculum activity.

5.8.1.2 Industrial training.

In the open ended data, a majority (77.87%) answered yes or that they have received an appropriate task during the industrial training.

In the interview data, the respondents gave a positive response towards the program having met the expectations of the job market. All (100%) of the respondents agree that industrial training helps to build employability skills. This is followed by 100%

agreement on the interpersonal skills and enterprise skills being important for employability.

Comments by the respondents:

The respondents gave several comments such as: that trainees should be given a chance to be involved in real project or meetings; let students work together with industry staff; be involved in communication with all levels; be able to give their opinions; the industrial staff could share their experience in dealing with clients or vendor; exposure to industrial presentation; students too should take the learning initiative; the seminars a preference for speakers from industry; students can develop their interpersonal and enterprise skills through some managed events, students are aware that there should be a continuous improvement and life long training to improve and continue to develop their employability skills.

Researcher comments:

In industrial training, the respondents either in open ended data or interview data strongly agree that they had received the appropriate tasks to build their employability skills. The students would like industry to give them a chance to get involved in real projects or meetings or let the students work with industry staff. The researcher understood that the industry has its own constraints. They have to meet the demands of their customers and deadlines. The trainee is a novice in the workplace, and can be a potential work "stoppers" or cause damage to the production line. This can delay the product delivery to the customers. Therefore, industry can not really involve the trainee undergraduate in real life projects at a deeper level but only at a surface level.

5.8.1.3 University life and co-curriculum activity.

Open ended data: Under this theme the respondents said that the most valuable session is the co-curriculum activity (21.86%). Communication (19.38%) falls second and thirdly, the seminars (10.63%).

Interview data: Most of the students (62.5%) responded that the co-curriculum benefited them most.

Comments by the respondents: They stated that they had the right networking lists for future employment. They also developed leadership qualities i.e. managing people and developing interpersonal and communication skills all levels.

Researcher comments:

The engineering respondents appreciate the university life particularly the co-curriculum activities. This is because they can develop their generic skills such as communication, leadership qualities, managing people and interpersonal skills. This is demonstrated by the open ended data and interview data both being supporting and positive.

5.8.2 Employer respondents

Open ended response:

Most employers in this study wanted to transfer real life working experience through hands-on and transfer knowledge from the experienced engineers to the trainees.

The least valuable part is that they are not happy with the trainees' situation caused by long familiarization periods. The attitude and willingness to work should be improved and work "stoppers", for whatever reason, are disliked by employers.

Interview response:

The employers stated that the training duration of 3 months is insufficient for the students, while there are employers who stated that the duration is not a factor but the initiative of the student to learn is more important.

What the employer requires from students are their degree qualifications in related fields, basic engineering software skills and generic skills i.e.: good command of English is a must and it is an advantage to know other languages such as Japanese. The employer explains that the causes of unemployment are due to the limited number of aviation companies in Malaysia (for the aviation industry), a lack of interpersonal skills, a lack of enterprise skills as to the environment not encouraging them to create new things, the market is small, therefore there is a loss of talented skills to other fields. The employers agree that there is no standard and systematic module for the industrial training. There is not much collaboration between industry and university. Only one particular University have a proper approach to collaborative work. Students who are weak in written English, engineering skills, public speaking should prepare themselves before interview.

Comments from the employer:

The employer has their own training module but not necessarily meant for undergraduate trainees. Trainees should declare their generic skills competencies and details through universities as part of their application for industrial training. Employers emphasize the attitude of 'I-want-to-learn' is expected from them, to deliver the job within given times and be competent in spoken and written English. Most of all, every employer insists that the training period should be extended from 3 months to 5 or 6 months. This will ensure ample time for the trainee to learn, understand and reflect everything they have learned in industry.

Researcher comments:

The data above shows that there are employers who try to help undergraduate trainees in delivering knowledge and the generic skills required in the workplace but there are also employers that feel that the undergraduate trainees slow their production line or cause them hassle. This study revealed that the employer has no specific module for industrial training. They do not have a specific measurement tool to assess the trainees' performance after their training. There are cases where the employers do not have any specific trainer to monitor the engineering graduate trainee on their premises. Eventually, at the end of their industrial training the student has not increased their knowledge in employment but some employers take this matter seriously.

5.9 Triangulation of student and employer data

This section supports the researcher's comments on the triangulation of both, the engineering undergraduate data and the employer data.

5.9.1 Programme evaluation.

The data are supporting each other by which the student found that the industrial training is the most valuable session, and in the interview the student also gave similar opinion that the industrial training helps them to be employed. The qualitative data shows that there are employers who try to help undergraduate trainees in delivering knowledge and the generic skills required in the workplace but there are also employers that feel that the undergraduate trainees can slow their production line or cause them hassle. Therefore, there is correlation between student's data and employer's data.

5.9.2 Industrial training.

In industrial training, respondents either in open ended data or interview data strongly agree that they had received appropriate tasks to build their employability skills. The students would like industry to give them more exposure and involvement in real projects or meetings within the industry as possible. The researcher understood that industry has its own constraints and limitations on this issue. Industries have to meet the demands of real production for their customer; they cannot compromise on production failure or errors. Therefore, the industry can not really expose the trainees to real life projects at the deepest level but only at a surface level. This is the limitation of employers towards industrial training exposing the trainees to real experience on the production line.

5.9.3 University life and co-curriculum activity

The engineering respondents appreciate the university life particularly the co-curriculum activity. This is demonstrated by the supporting and positive data from open ended and interview data. The students can develop their skills on how to manage an event, socialization with other students from different faculties and at the same time develop their generic skills. Within the industrial training environment, the students learn to socialize amongst their working colleagues. Employers prefer to gain ideas, opinions and creative suggestions and innovative ideas from the students but this does not happen often. The differences are due to a communication gap in the work place. Maybe because they are weak in the English language, they have low confidence to mix with their working colleagues.

5.10. Discussion.

The researcher found that the university and employer have each contributed in producing talented engineers. This is supported by the undergraduate statements that the programme they received really increases their knowledge and gave them an engineering background. Industrial training also offers them a better chance of getting employment. Thirdly, the university co-curriculum has developed the engineering undergraduate generic skills. Therefore, the engineering undergraduates have given a positive conclusion to their programme, industrial training and university life and co-curriculum.

The triangulation method between the open-ended data and interview data has shown that the students have improved their communication skills through presentations and industrial training, while they have received the basic knowledge of engineering subjects that the workplace needs. Co-curriculum activities provide them with other social skills, such as leadership, managing people and problem solving. Co-curriculum gave them a forum to improve their interpersonal skills.

The students did suggest having grooming classes to polish their personal development according to market needs. Future female engineers especially in Civil Engineering, can be as competent as their male colleagues if their safety in the workplace is being taken care of.

The study also shows that most students do not appreciate the humanities studies such as Islamic Studies, Islamic Civilization, Morale, National Studies etc. They show their rejection through their statement:

UB139: Abolished none connected subject to programme modules.

The researcher assumes that either the student does not understand the value of the subject so that as an engineer, they will be loyal to the environment and society with their inventions and engineering works. The other assumption may be that the lecturer's approach in teaching may not boost the student's interest in the subject. This is supported by the student comment in the open ended data:

> UB 85: some lecture is quite boring and the students will feel sleepy because doesn't has the involvement of students. This lecturer is only a "lecturer" not a "teacher".

The employer data shows that there are employers who try to help undergraduate trainees in delivering knowledge and the generic skills required in the workplace. They provide an allowance for the trainees as incentives. But there are also employers that feel that the undergraduate trainees slow their production line or cause them hassle. This study revealed that the employer has no specific module for industrial training. They do not have a specific measurement tool to assess the trainees' performance after their training. Trainees also have problems in writing a report at the end of their training. There is no standard assessment on which criteria should be used to assess the student. There are cases where the employer does not have any specific trainer to monitor the engineering undergraduate trainee on their premises. As a consequence the student did a task that is not going to increase their knowledge in employment. Some employers took this matter seriously.

Employers are looking for more positive collaboration with universities, rather than just written communication and they prefer face to face interaction.

Universities can offer help on their specialist areas such as joint work to create industrial training modules, and create the assessment tool for undergraduate engineering trainees. With this, the university and industry can build a very strong rapport for future projects.

Industry should consider industrial training as a serious matter. They can not continue to use excuses that there is no one to supervise the trainees. Therefore, an option should be offered for the future. This is because the engineering trainees are the future industrial manpower. If the employer provides the training half heartedly, then the employer has really ruined their prospective engineering staff.

5.11 Summary.

This chapter has interpreted and presented the measurement of interpersonal and enterprise skills from the open-ended and interview sources, in establishing these skills for employability needs.

This study shows that even though the engineering respondents have declared that they have received quality industrial training in chapter 4, chapter 5 demonstrates through the student experience and verbal admissions that there are some unsatisfied issues or areas that are highlighted. There are positive comments from the employers that they could deliver better training if they had a specific module and appropriate staff allocated to monitor and help the trainee for the industrial training. Both the employer and engineering undergraduates agree that the length of the training period should be extended to 5 or 6 months. Therefore, there is a positive relationship in the responses from the students and employers.

The next chapter will look into the relationship established through the triangulation of the quantitative results and qualitative results. A discussion on the research findings and future developments will also be presented.

CHAPTER 6

METHOD TRIANGULATION, DISCUSSION, IMPACT, CONTRIBUTION AND IMPLICATIONS

6.0 Overview

This chapter discusses the work that has been carried out in exploring and investigating the suggested lack of interpersonal and enterprise skills amongst engineering graduates contributing to the unemployment issue. It provides a whole picture of the research with its ultimate results. Recommendations for future research directions are also given.

6.1 Review of achievement

The main objective of this research is to measure the impact of university programmes, industrial training and university life and co-curriculum activities on engineering undergraduates. The researcher set out to measure the development of interpersonal and enterprise skills amongst final year engineering undergraduates from government and private universities in Malaysia. Are these skills sufficient in the context of the work place and do they cause a framework shift towards a socio-cultural approach in engineering education? This chapter brings together the result from chapter 4 and 5s' results.

6.2 Triangulation and discussion of the relationship between methodologies.

6.2.1 Relationship of the students programme findings

Table 6.1: Relationship of the programme has developed the engineering student's interpersonal skills and enterprise skills.

Data set/sources	Response from the engineering undergraduate
survey-closed-ended	Positive response
survey-open ended	Valuable session- communication + industrial training + engineering subjects. Least valuable- humanities subjects - less hands-on comments - abolish humanities subjects - more hands on /industrial training
Interview	25% voted programme offered 12.5% -final year project. 62.5% - meet job expectations

The engineering student frequency tables (Table 4.1 to Table 4.11, in chapter 4) of the GTQ on programme evaluation illustrates that the highest score is in the agree column (refer to Table 4.1, Table 4.4, Table 4.8, Table 4.9, Table 4.10, and Table 4.11). The second highest scores are in the satisfied column (refer to Table 4.2, Table 4.3, Table 4.5 and Table 4.6, while Table 4.7) shows a similar amount of respondents (33.5%) in the satisfied and the agree column that the programme has improved their skills in formal and informal written communication. This gave a perspective that the students agree that the programme they took gave them some generic skills they require for their future employment. This finding has confirmed the previous literature (Kagaari, 2007); students showed positive response in questionnaire survey. As it is clear from the literature respondents to quantitative questions can sometimes respond as the feel they should respond, rather than always being fully honest. Thus, another instrument which is interview was used to complement the first instrument for a better perspective of the situation and population under study.

Table 6.1 revealed that there are correlations between the open ended data and the interview data. The data are supporting each other in that the students found that the industrial training was the most valuable session, and in interview the students also found that the communication, industrial training and engineering modules were the most valuable sessions to help them gain employment. Therefore, there is positive relationship between the open-ended data and the interview data.

6.2.2 **Relationship of the student's industrial training findings.**

Table 6.2: Relationship of the engineering student's results and employer results that industrial training has developed the engineering student's interpersonal and enterprise skills.

Data set/source	Engineering undergraduate	Employer
Survey	Positive response	Positive response
Open ended	Appropriateness- 77.87% ; yes Training period- 69.73%; not long enough Comments- 59.37%;more student participation	Process of real life work experience transfers from experienced engineers.
Interview	Positive response (100%) that industrial training helps to build employability skills	No proper training modules/ assessment, open for further collaborations, more communication with university

The overall evaluation in the GTQ of the industrial training (Table 4.12 to Table 4.22) illustrates that most students agree that employers transfer generic skills and knowledge to the engineering student whilst they are doing their industrial training. This is supported by the highest scores being in the agree column (Table 4.12, Table 4.13, Table 4.14, Table 4.15, Table 4.16, Table 4.17, Table 4.18, Table 4.19, Table 4.20, Table 4.21, and Table 4.22). The second highest scores are in the strongly agree column (Table 4.12, Table 4.15, Table 4.16, Table 4.17, Table 4.19, Table 4.20 and Table 4.21). While only a few (Table 4.13, Table 4.14, Table 4.18 and Table 4.22) are in the satisfied column. This finding supports Zakaria, et.al. (2006) study that students are aware of the importance of industrial training to their future development. This also demonstrates a strong support for the work done (generic skills transferred) by the employer for the engineering student during their industrial training.

As for most of the employers, the highest scores (Table 4.38, Table 4.39, Table 4.40, Table 4.41, Table 4.42, Table 4.43, Table 4.44 and Table 4.47) are in the satisfied columns whilst others are in the agree column (Table 4.45, Table 4.46 and Table 4.48). The assumption of the employers is that they are satisfied that the average generic skills delivered to the student are appropriate to the work place requirement. Therefore, the students and the employers are both satisfied with this element. The employers have helped the student with employability skills exposure. Thus, the employers are satisfied with the contents they deliver to the student during their industrial training.

In industrial training, students either in the open-ended data or the interview data strongly agree that they had received an appropriate task and built their employability skills. The students would like industry to give them a chance to get involved in real projects or meetings or allow them to work with industrial staff. The argument here is that the trainees are very new to the workplace, and as a consequence could cause production interruption (Saadany, et.al., 2007) that can delay product delivery to customers. Therefore, industry cannot really expose the trainee undergraduates to all real life projects at a significant level but only at a surface level.

This finding shows that the survey, open ended question and interviews supported the fact that the industrial training has developed the engineering students interpersonal and enterprise skills. Most engineering students agree that they were given an appropriate task during industrial training. 100% of respondents agree that the industrial training has helped to build employability skills (Zakaria, et.al.2006). Thus, the engineering students agree with the importance of interpersonal and enterprise skills development in the workplace (McCounnell, 2004; Van Slyke, Kittner and Cheney, 1998; Doke and Williams, 1999; Bailey and Stefaniak, 2000).

Table 6.2 also illustrates positive relationship between the engineering students results and employer results that the industrial training has developed the engineering students interpersonal and enterprise skills. The survey, and opened data support each other.

The combination of students and employers interview data shows other information in the findings. However, as the researcher proceeded with data interpretation the researcher noted that different types of data were collected according to the method and their combination contributed to a more nuanced understanding of the phenomenon than initially anticipated. There was a contradiction in the interview section, engineering students thought that they had received valuable knowledge and industrial training had helped to build employability skills. The actual state was that the employers have no standard module or training package that could monitor the progress, standard and quality of the industrial training. There is no standard assessment tool to measure the engineering students' knowledge throughout the industrial training. How ever does this affect the industry transferable skills, knowledge and experience to the trainees? This study had shown evidence that majority of the student respondents had benefited from the industrial training. In the researcher's opinion, to have a well organised standard module is better. Future development of training upgrading can be done and documented to achieve the training objective and quality. This may sound idealistic but it can be done for the better future of manpower development.

6.2.3 Relationship of students university life and co-curriculum activities

Table 6.3: Relationship that the university life and co-curriculum activity has developed the engineering students interpersonal and enterprise skills.

Data set/sources	Response from engineering undergraduates
Survey	Positive response
Open ended	Valuable session in co-curriculum, communication and seminars. Least valuable session-limited budget for co-curriculum activity, less of practical exposure in industrial training and project. Comment- more practical exposure in industrial training and more budget in co-curriculum activity.
interview	Grooming class, university and industry collaboration, specialize engineering programme, extend industrial training, change exam oriented system and more practical skills and explore society.

The engineering student GTQ on university life and co-curriculum activity (Table 4.23 to Table 4.33) demonstrates that the highest scores are in the agree column (Table 4.23, Table 4.25, Table 4.26, Table 4.28, Table 4.30, Table 4.31, Table 4.32 and Table 4.33). Whilst, the next highest response is in the satisfied column

(Table 4.24, Table 4.27 and Table 4.29). Therefore, the students generally agree that the university life and co-curriculum activity has developed and transferred the generic skills they required for future employment.

The researcher found that Table 6.3 shows a positive response through the survey, open ended and interview data. The survey illustrated a positive response and was supported by an open ended question response that the co-curriculum activity has increased the engineering students' communication skills. The engineering students acquire benefits from seminars conducted during their university life.

The contradictory component with regards to the co-curriculum activity is that the engineering students found that the budget for this activity is limited. Therefore, the students have less and limited activity in co-curriculum. The engineering students gave a positive response and suggested converting the co-curriculum activity into a module and ensuring that all students participate.

In the interview section, the students gave positive comments as to how to improve the personal development outcome for engineering students. They suggested having grooming classes, more university and industry collaboration, a specialized engineering programme, extending the industrial training, replacing exam oriented systems with more practical skills and a chance to explore society. In this section, even though the contradiction was there the percentage was insignificant against a positive response.

6.3 Overview of the research findings

6.3.1 The impact of universities programme

The researcher found that the university as an institution has contributed in producing talented engineers. This was supported by the undergraduate statements that the programme they received had increased their knowledge and they have acquired a good engineering background, this agrees with previous research (Pandian and Aniswal, 2005). The university co-curriculum activity has developed the engineering undergraduate generic skills. Therefore, the engineering undergraduates gave a positive conclusion to their programme, industrial training and university life and co-curriculum outcomes. Whilst, the employer's interview had contributed evidence that based on the weakness of the student's performance on documentation writing, they need more guidance from the university. The employers also would like the university to review the curriculum to balance the theoretical and practical aspect of the engineering education. According to the employers, there is evidence that students find it difficult to understand and perform during their placement in the industry. Thus, the finding of this study suggests that both university and industry have to work on the collaboration agreement to see how each party can complement each other.

6.3.2 The impact of teaching approach.

Many scholars have written about teaching approachs (Norlena et al.,2001; Zalizan, 2000; The National Higher Education Research Institute, 2005; Mahmoud, 2000; and Molly, 2004). These scholars agreed that a strategic teaching approach could enhance students learning outcomes in terms of knowledge and generic/transferable skills. This study has contributed to the need for higher education institution educators to look into the matter seriously. The researcher felt educators should always reflect and evaluate their teaching approach to the best of their ability to enhance graduate output (Davies et.al., 2006) to the needs of work market. Of course, learning for personal and future career development does not end after graduation but it is a lifelong learning process (Halstead, et.al., 2004) both for the students and to the HEI educators.

6.3.3 The impact of employer contribution

This study has explored employers' contributions in producing talented engineers. The undergraduate statements supported the idea that the industrial training provided had increased their employability knowledge and skills.

- Sincerity of training

The data above shows that there are employers who tried to help undergraduate trainees by delivering knowledge and generic skills required in the workplace. They also provide an allowance for the trainee as an incentive. But there are also employers that feel that the undergraduate trainees slow their production line or cause them hassle. There are cases where the employers do not have specific trainers to monitor the engineering graduate trainee in their premises. As a consequence the student did tasks that do not increase their knowledge in employment, whilst some employers took this matter much more seriously.

- Face-to-face interaction

Employers are looking for more positive collaboration with universities, rather than communicating by letter and they prefer face-to-face interaction or interpersonal relations. This study revealed that employers would prefer interpersonal contacts rather than more traditional methods. Therefore, in the Malaysian context, interpersonal skills are not only important to students for workplace usage but are also important to university-industry network and collaboration.

6.3.4 The impact of interpersonal and enterprise skills

This study has highlighted the nature of engineering work (section 2.1.4). It was described as engineers who must have the technical knowledge but can not deny that interpersonal skills and enterprise skills are needed for the success of engineering projects (McCounnell, 2004; Van Slyke, Kittner and Cheney, 1998; Doke and Williams, 1999; Bailey and Stefaniak, 2000; Saadany, et.al., 2007).

The literature has described that to bring a product to market involves concurrent engineering, and the coordination of team members is most important. Interpersonal communication skills are needed to up date information and monitor the current state of the project through regular meetings or similar. Interpersonal skills also can help to reduce the mis-communication that happens in the supply chain, and in product development network. Thus, the awareness of the importance of interpersonal and enterprise skills can help avoid project failure. Therefore, supported by the literature for workplace requirements, engineers today must equip themselves with interpersonal skills and enterprise skills.

6.3.5 The impact of the Generic Transfer Questionnaire (GTQ)

The purpose of the GTQ was to measure the engineering students interpersonal skills and enterprise skills competency. This study has discovered that the GTQ can be used as a measurement tool to measure scores in interpersonal skills and entrepreneur skills after attending certain programmes or related activities. This could contribute to information as to whether a programme or activity has affected the students' interpersonal skills and entrepreneur skills. Therefore, further action can be taken to improve the present situation in interpersonal and enterprise skills.

The GTQ can be used to measure interpersonal and enterprise skills in other disciplines of study. This is due to no specific terms or concepts referring to any discipline. It is based on items in generic skills (attitudes). Therefore, the GTQ can be use to measure interpersonal and enterprise skills transfer in humanities, medicine, business or other disciplines.

6.3.6 The impact of the humanities module

The researcher found that among the survey, open-ended and interview responses shown in Table 6.1, the engineering students showed differences in opinion. The survey and open-ended responses regarding the programme having developed their interpersonal and enterprise skills were supported by the interview responses. But there are contradictions related to the least valuable session in offered programme. These were the humanities subjects such as Islamic Civilization, Nationhood, and others. They stated that these subjects do not relate or contribute to engineering and employability. This really surprised the researcher, because as part of the teaching staff, the researcher thought that the students really appreciate this subject matter. But this study reveals the contrary.

The researcher assumes that the students do not understand the value of the subject. The literature has established that as an engineer, they should be loyal to the environment and to society. The other assumption may be that the lecturers approach to teaching may not boost the students' interest in the subject (ASCE, 2004). Therefore, HEI educators should try to demonstrate the connection of the subject to real engineering work. With more information, the researcher believes that this negative attitude can be reduced.

Humanistic skills are very important in producing a balanced engineer. It is unfortunate that this study revealed that there are 24% of engineering students who wanted to abolish the subject. Another 12% (who thought that the humanities studies) were found irrelevant the university life and co-curriculum least valuable section. Inline with Ramsden, (1992), HEI educators should look for strategic methods to ensure academic quality and generic skills transfer without overloading the students. Recent literature has also indicated that engineering education today is focusing on helping not only local but global communities with issues such as poverty etc. Therefore, the humanities modules should play an important role in developing and shaping these skills in engineering students. This study found a negative impact of the humanities modules in the minds of students.

6.3.7 The impact of the industrial training

- More hands-on/industrial training

The engineering students requested more hands-on sessions in the curriculum or industrial training sessions (Zakaria, 2006). They felt that the current hands-on sessions were insufficient for employability. The students wanted the university to review the engineering curriculum and try to balance the theory and hands-on sessions.

- No industrial training module/package

The employer mixed method reveals that there is a correlation between the survey structured data and the open ended data. It shows that the employer has positively tried to transfer interpersonal skills and enterprise skills through industrial training with the help of their experienced engineers. The contradiction was in the interview section, where this study revealed that the employer has no standard module and standard assessment tool for industrial training. Perhaps the employers have a training package for their employee staff but not for the trainees in industrial training. Therefore, this contradicts the intention of providing quality industrial training to the engineering students. Students are only asked to write a report regarding what they have achieved and learned during their industrial training.

- The length of industrial training

Even though there is 100% agreement about the employability exposure contributed by employer, the contradiction was that the engineering students agree that the training duration (3 months or 12 weeks) was not enough to give them ample time to correlate the theoretical aspects of what they learned in university to the workplace and to reflect on the new knowledge and practical exposure they received during the industrial training. Therefore, they would prefer the industrial training to be extended to 6 or 12 months. The engineering students also wanted the employer to allow them to participate in daily work activities such as meetings, presentations, problem solving and real industry projects. From the employer's point of view, they have some limitations on student participation. This is because they could not tolerate the risk of daily production failure. The researcher believes the employers can create opportunities in meetings. In the United Kingdom, students participate fully in the meetings in industry. Subsequently, the supervisor can provide some feedback or opinion regarding the meeting. This feedback can be presented to the meeting for evaluation and further action. If their feedback is beneficial to the industry, appreciation should be given to the student. Therefore, they would know that their ideas are being acknowledged.

6.3.8 The impact of co-curriculum activities

The engineering respondents appreciate university life; especially the co-curriculum activity. This is because they can develop their generic skills such as communication skills, leadership qualities, managing people and interpersonal skills. This is demonstrated by the open ended and interview data both supporting each other and being positive. The students did suggest having grooming classes to polish their personal development according to market needs.

The students also did recommend changing the co-curriculum activity into a module and making it compulsory for every student. This could have a great influence on the personal development of every engineering student. The objective and outcome would be much clearer. Thus, it would be easier to measure the students' personal development outcomes.

6.3.9 The impact of a mixed-method

The researcher learned that with a mixed-method, the hidden data within the quantitative data could be exposed by use of the qualitative data. More of the respondent's experiences and emotions are highlighted and that enriches the findings.

The relationship between data source of open-ended and interview data has shown that the students improved their communication skills through presentations and industrial training, they have also received the basic knowledge of engineering subjects that the workplace needs. Co-curriculum activities provide them with other social skills, such as leadership, managing people and problem solving. Co-curriculum gave them much scope to improve their interpersonal communication skills.

Qualitative data, when it is included, can provide rich insight into human behaviour. Human behaviour, unlike that of physical objects, cannot be understood without reference to the meanings and purposes attached by human actors to their activities. Therefore, choices of mixed methods in this study gave the researcher more in-depth understanding of the samples and issues under study.

6.3.10 The impact of Exploratory Factor Analysis (EFA)

The Explanatory Factor Analysis (EFA) is a multivariate statistical method used for a wide variety of purposes. These include revealing patterns of interrelationships amongst variables. It also detects clusters of variables, each of which contains variables that are strongly inter-correlated and hence somewhat redundant (Appendix 7). This was illustrated in the second run of EFA (Table 4.43), where most of the unrelated variables were removed. Additionally, it can reduce a large number of variables (33 variables) to a smaller number (4 factors) of statistically uncorrelated variables, the factors that is each linearly related to the original variables. Therefore, with these, the researcher confirmed that the engineering student questionnaires construct and high reliability scores (Cronbach Alpha :0.955 and EFA) shows that the measurement tool in this study was valid and reliable (Tabachick, 2001).

- Reflect actual situation of population

Six-point Likert scales were used in this study to avoid regular behaviour by respondents who like to choose the middle scale if they are given an odd number of choices. This could produce a more natural situation about what is happening in the population studied. The data analysis actually revealed that most responses are in the middle scale between points 4 to 5. This is supported by the frequency mean (appendix 6). Therefore, the researcher notices that it is not only the nature of respondents to choose the middle scale but it is more a reflection of the actual situation in the population.

6.3.11 The impact of employer and student frequency comparison

From the employers and students frequency results, all the tables (Table 4.49 to Table 4.59) show most of the students have received knowledge transfer of generic skills with reference to the high scores being towards the right of every table. The employers have also shown that they have delivered the generic skills to the students during their industrial training; this is also due to the high scores in the right section of the tables. Therefore, this finding has confirmed the previous research (Dodge, 2008) that the students positively assumed to have received a very good foundation in the generic skills required for the work place, while the employers assumed that they have delivered a quality industrial training regarding generic skills development.

6.3.12 Impact of gender issues

Female engineers, especially in civil engineering, are concerned with their safety in the workplace especially on site and during long working hours. Therefore, this might show a limitation for female engineers. There are no significant difference (male 52.7%, female 42.8%) between gender enrolments (Chapter 4, section 4.2.3).

Malaysian culture does not affect female engineers in Malaysia (Ismail, 2008) when compared to female engineers in India. They have same amount of learning hours, equipment and meeting hours with their supervisor as do their male colleagues. In terms of job opportunities, female and male engineers have a fair chance to be accepted by any employer but restricted by obligation to family, societal-barriers and organizational related barriers (Ismail, 2008).

6.3.13 Summary of findings

Figure 6.1: Development of interpersonal and enterprise skills

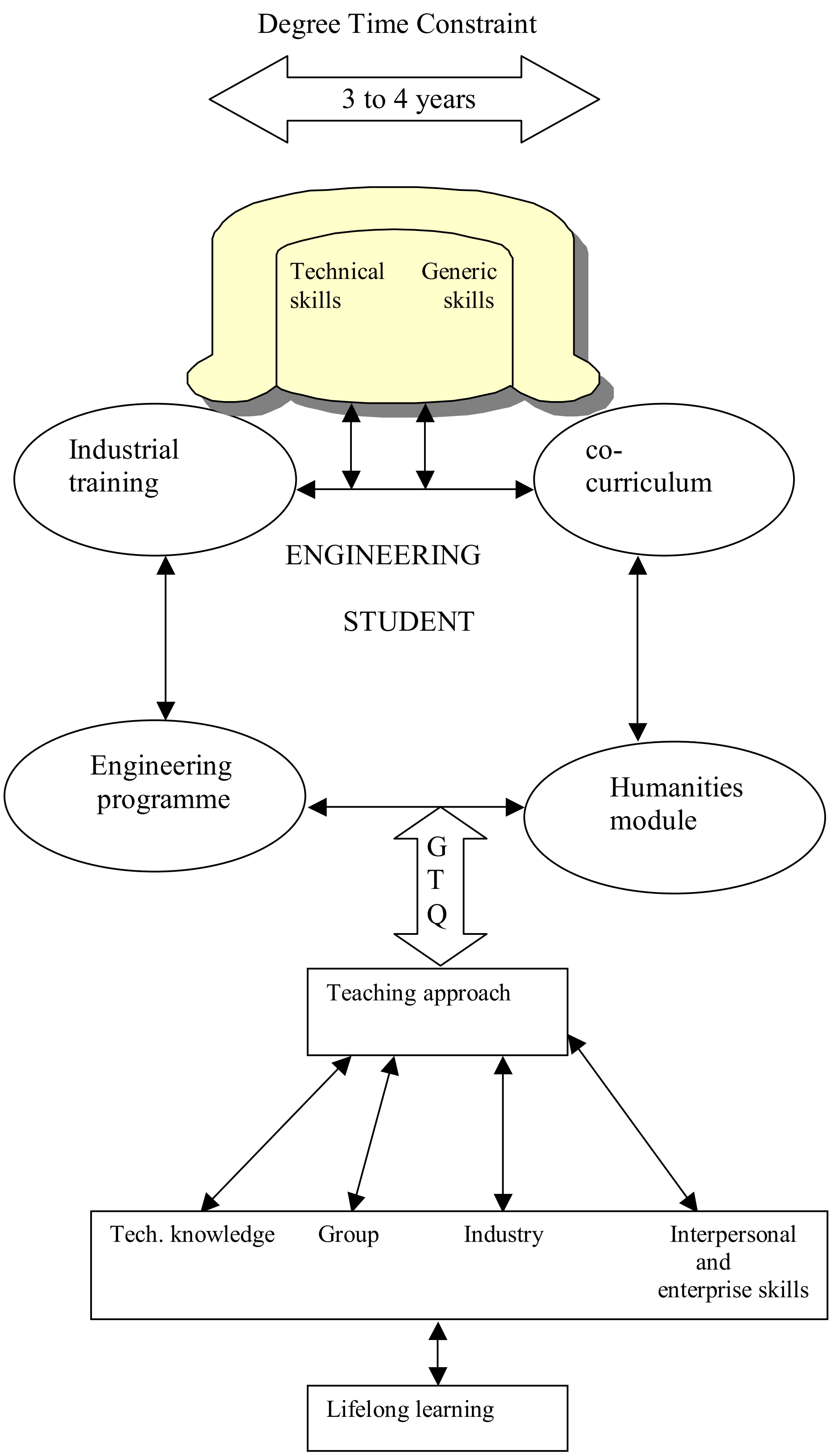


Figure 6.1 above illustrates the development of generic skills amongst engineering students. The HEI has its constraint within 3 to 4 years of the engineering degree programme. The university has to ensure that those students are equipped with the technical skills knowledge and generic skills. Therefore, the university plays its part by providing the student with technical engineering knowledge, co-curriculum activity and humanities knowledge. Industry provides the industrial training needed by the students. The university and industry collaboration has hopefully balanced the technical and generic skills needed by the students within the time constraint. Another alternative learning approach is through university project work developing the skills needed by the engineering students; such as technical knowledge, group work, industrial training and generic skills (section 2.12).

This study suggests that some change is possible even if it is minor. Most importantly before implementing any changes, the HEI, policy and curriculum makers and HEI educators and employers involved should not only be aware of the importance of interpersonal skills and enterprise skills for engineering graduates but also should be enthusiastic to make the changes for a better outcome.

- An appropriate learning approach

There are universities which practice learning approaches such as problem based learning and have shown improvement to students' interpersonal skills and entrepreneur skills (Kolmos, 1996). Therefore, an appropriate approach should be taken into consideration for a better outcome of interpersonal skills and enterprise skills.

- Maximize employer participation

This study has shown that an employer is part of the education system involving engineering graduates and that there is room for improvement regarding industry participation in building competent engineers. Therefore, collaboration between universities and industry is crucial to improve the engineering manpower towards industrial nation building in Malaysia.

6.4 Contribution and implications of the study

The researcher believes that the results of this study may prove useful not only for university educators but also for HEI's who are responsible for the intake of HEI educators and their development as well as the curriculum planners when developing policies, and designing programmes.

HEI educators may use these findings to establish better practices. The HEI can also benefit in terms of future development and/or evaluation of HEI engineering and non-engineering educator programmes. The policy makers and curriculum planners may reconsider some of the issues raised by the students and employers before implementing change in the HE engineering education curriculum. The decision to adopt new teaching approaches (Zaliza, 2000; Norlena, et.al., 2001) is crucial as they are impacting on HEI educators and their attitudes and beliefs about such changes and most importantly on the students' learning.

This research has certain implications for HEI educators and HEI educators for continuing professional development, policy makers, implications for employer participation and implications for future research.

6.4.1 Implications for HEI educators

The results from the qualitative: open-ended and interview data provided rich evidence of what was the impact of HEI educators teaching styles in the classroom. This research has increased the awareness of the importance of the HEI educators' role; an appropriate approach could be used to extend the output from engineering students in the classroom.

HEI educators can use this study to reflect on their current practices and their interaction with students. The teaching styles or learning styles chosen could encourage learners and lead to interactive outcomes (Chapter 2, section 2.9) as commented upon by students in their open-ended answers (Chapter 5, section 5.4.1).

6.4.2 Implications for policy makers and curriculum planners

The research findings are also beneficial for policy makers and curriculum planners. In current practice, there is limited awareness about implementing generic skills such as interpersonal skills and enterprise skills in university programmes. Consideration into measuring generic skills outcomes would be beneficial for all engineering students in either their curriculum vitae or personal development.

The researcher felt that to implement generic skills in the curriculum, there must be direction or enforcement from the Malaysian Ministry of Higher Education. The generic skills should be evaluated in the first registration year and toward the end of the study. Failure to achieve a certain score could disqualify the student from graduating. This could ensure seriousness amongst students and implementers, thus, increasing the students' generic skills competencies that are required by the workplace.

6.4.3 Implications for employer participation

Employer participation in developing competent engineers should be more radical and serious. Issues like modules/training packages for industrial training should be considered to justify the employers' intention in transferring workplace knowledge to engineering undergraduates. The employer could reflect their programme quality through an appropriate measurement/assessment tool. Yearly module/training diagnosis could improve the industrial training programme offered. Therefore, this could ensure quality, save training time and reduce financial impact.

Employers would prefer to have their feedback regarding trainees to be known (chapter 5; section 5.7), possibly through a feedback survey form or any appropriate channel where everyone involved in the industrial training could sit together and discuss the quality of the programme offered.

The Government could play an important role in coordinating the collaboration between universities and industry. Issues such unsupervised trainees could be avoided. This is because trainees are industry's future manpower. If the employer offered training half heartedly, then the employer has really ruined their potential future engineering manpower quality.

6.4.4 Implications for future research

- Resistance to humanities modules

The researcher felt that the avoidance of humanities modules by engineering students is discouraging. Further and deeper investigation should be undertaken. The investigation should look at the cause of rejection by engineering students regarding the subject matter. Developed countries such as America, Germany and France all include humanities modules in their engineering curriculum (chapter 2, section 2.4.3). The researcher is doubtful as to whether other countries had similar experiences or it is unique to Malaysia. The researcher may assume that the approach taken by HEI educators may be wholly appropriate. Their teaching methods being traditional do not influence engineering students towards the humanities or maybe it is due to the humanities teaching staff not having an engineering background. Therefore, they fail to devise an appropriate approach to deliver the subject matter. Further research may explain this situation.

- Develop an industrial training module

This study has identified that the university could help the employer in their area of expertise such as joint efforts to create industrial training modules/training packages, and to create the necessary assessment tool for undergraduate engineering trainees. As a result, the university and industry can build a very strong rapport for future projects.

- Include HEI educators as respondent, observational methods and longitudinal studies.

Future research should consider looking at the HEI educators; their perspective on interpersonal skills and enterprise skills, teaching styles, and observation of engineering student participation in the classroom, as well as observation of the student in their industrial training. Longitudinal studies, over several years could provide richer information with regard to the nature of the interpersonal skills and enterprise skills practices. Future research perhaps should consider looking at the impact on students' learning at the end of their study or follow them through for the next few years. This could provide insights into the factors that influenced engineering students' interpersonal skills and enterprise skills.

- Learning approaches

The present study also offers some implications for the use of learning approaches in the classroom. Hence, this brings the researcher into thinking of what more could be done to improve the development of interpersonal skills and enterprise skills amongst engineering undergraduates. Perhaps, real life action/situation/exposure to dealing with professionals could become one of the many alternatives for change. Besides, what the HE engineering educators need the most are continuous support, training and exposure to the use of different learning approaches in the classroom.

The findings reflect the importance of GTQ scores for HE engineering educators to ensure change is taking place. Further research into the interpersonal skills and enterprise skills training and support provided for HE engineering educators is highly recommended to understand the extent to which innovations could make teaching interpersonal skills and enterprise skills more enjoyable. At the same time new strategies to improve the interpersonal skills and enterprise skills implementation process could also be identified.

6.5 Concluding remarks

What has motivated the researcher during the research process? The researcher has been enlightened with the knowledge and experience gained as students and employers responded to the survey, open-ended questions and interview session. All these sessions have enriched the findings for the researcher, sharing student's experiences of the university programme, industrial training and university life and also sharing the employers' concerns about their challenging job responsibilities and contribution towards engineering undergraduate's employment development.

The research opens up a new way of seeing and understanding the developments of interpersonal skills and enterprise skills in HEIs and the impact they have on practices and employability. It is a new way of understanding the situation from wider perspectives: from the researcher's experience, the engineering students and the employers' opinions.

The engineering students did not understand their lack of interpersonal skills and enterprise skills. The employers' responses to the interview have shown the engineering students weaknesses. Conversely, responses from the survey, open-ended questions and interviews of the engineering students have highlighted the employers' weaknesses. This measurement could lead to better understanding of both sides.

Consideration of interpersonal skills and enterprise skills as a part of the graduation criteria is an important factor. The demand for academic excellence somehow determined the implementation of interpersonal skills and enterprise skills success in developing the undergraduate engineer's personal development. Support from the Ministry of Higher Education in coordinating the collaboration between universities and industry could smooth the partnership for the benefit of engineering undergraduates and employment.

Clearly, what can be seen here is that the GTQ measurement tool is important for HEI and the employer as an interpersonal skills and enterprise skills pre and post training assessment. The result could inform both parties giving feedback on the process taken, the next actions to be taken and student's strengths and weakness.

This mixed-method study with the strength of the methodologies triangulation provides in-depth study and ensures richness of data. The present study may encourage future research into interpersonal skills and enterprise skills to adapt similar methods and to be thorough in qualitative and quantitative data. The open-ended questions and interviews done proved to be informative in their own ways. The present study could also guide any future researcher to monitor continuing changes in interpersonal skills and enterprise skills in Malaysia as HE engineering educators integrate the benefits of more interactive teaching with the traditional cultural practices embedded in the engineering curriculum.

CHAPTER 7

CONCLUSION

The exploration and investigation in this study aimed to assess whether the suggested lack of interpersonal and enterprise skills competencies causes unemployment amongst engineering graduates in Malaysia and concluded that it is not a major contributor. This study has provided evidence that the degree programme, industrial training and university life and co-curriculum activities have contributed to the development of interpersonal skills and enterprise skills but that there is space to enhance these skills for a graduate's future career development.

This study also highlighted other issues related to the enhancement of the engineering education curriculum. Issues such as a longer period of industrial training, an industrial training module and a standard industrial training assessment instrument would be of added value to the engineering education curriculum. A great emphasis on elective module such as management skills was highlighted to be an advantage to engineering undergraduates. A review of the teaching approach of the humanities modules such as Islamic Civilization, Nationhood and related modules should be undertaken for a better acceptance and therefore better learning by engineering undergraduates.

It is clear that more consideration could have been given to the approach taken in choosing the employers for the interviews. The researcher has realised that the background of the employers in this study should be revised for future work. This study did not fully explore the impact of culture and ways of thinking within organisations and did not therefore properly consider the background of the employer; one was from a western organisation and the other from a Japanese organisation.

In more detail the study has concluded and recommended the following points: issues of interpersonal skill and enterprise skill in the engineering workplace, for HEI, for policy makers, for engineering curriculum designers and HE engineering educators.

The design of the Generic Transfer Questionnaire as an assessment tool for interpersonal skill and enterprise skill, can be used as a good measurement tool for the future studies not only in the engineering field but in general. This can be applied to any type of degrees programme.

Guidance and justification on how the methodology developed for the study of generic skills produced a framework for interpersonal and enterprise skill enhancement in engineering curriculum.

An aid to increase interaction between universities and employers through lots of meetings, forums, workshops and other face-to-face interactions for better collaboration and understanding of needs between both parties in the future.

Traingulation providing a real understanding of the impact of a mixed-method study on interpersonal and enterprise skills amongst engineering undergraduates. The interview data really gave a richness and robustness to supplement the survey data. This gave strength to this study.

Co-curriculum activity plays an important part in developing the engineering students interpersonal and enterprise skills. Mean while, industrial training plays an important part in developing and exposing students to employability skills and workplace experience.

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APPENDICES

Appendix 1: 16 core values integrated into the Malaysian education curriculum inhe KBSR (elementary level) and KBSM (lower and upper secondary)

1.Cleanliness of body and mind:
- Personal cleanliness;
- Cleanliness of the environment

2. Compassion and tolerance:
- Compassionate;
- Generous;
- Charitable;
- Tolerance;
- Considerate;
- Hospitable;
- Patience.

3. Cooperation:
- Mutual responsibility;
- Fraternity

4. Courage:
- Courage as opposed to foolhardiness

5. Moderation:
- Moderation in thought;
- Moderation in speech;
- Moderation in action

6. Diligence:
- Industriousness;
- Hardworking;
- Perseverance;
- Dedication

7. Freedom:
- Freedom within the law;
- Freedom to choose;
- Freedom from slavery

8. Gratitude:
- Gratefulness;
- Thankfulness;
- Appreciation

9. Honesty:
- Truthfulness;
- Trustworthiness;

- Sincerity

10. Humanity and modesty:
    - As opposed to showing off;
    - As opposed to arrogance;
    - Admission of one’s fault

11. Justice:
    - A sense of fair play;
    - Concept of reward and punishment

12. Rationality:
    - Flexibility of thought;
    - Weighing of alternatives

13. Self reliance:
    - Responsibility;
    - Independence;
    - Autonomy

14. Love:
    - Love for the environment;
    - Love for the life and humanity;
    - Love for the nation, patriotism;
    - Love for the peace and harmony

15. Respect:
    - Respect for rules, law and authority;
    - Respect for time and punctuality;
    - Respect for institutions;
    - Respect for exemplary behavior;
    - Respect for parents;
    - Respect for elders, teachers and leaders;
    - Respect for another’s beliefs and customs;
    - Respect for knowledge and wisdom

16. Public spiritedness:
    - Spirit of *gotong royong* (working together);
    - Sensitiveness towards societal needs

APPENDIX 2-Letter of consent and student GTQ questionnaire

18/5/06

Faculty of Engineering and Computing
Coventry University
United Kingdom

Dear respondent,
Project Title: **Exploring Engineers Employability Competencies Through Interpersonal Skills and Enterprise Skills.**

I am a PhD student at Coventry University. My study is being supervised by Mr. Ian Dunn, Associate Dean of Engineering and Computing, Coventry University. The purpose of this study is to explore if unemployment amongst engineering graduates in Malaysia, is caused by interpersonal and enterprise skills competencies: to investigate if the engineering undergraduates had received a quality placement/industrial training (appropriate to their learning knowledge and employability skills); and to develop and recommend solutions to enhance interpersonal and enterprise skills competencies amongst Malaysian engineering undergraduates.

I'm pleased if you could spend 10-15minutes of your precious time to respond to the questionnaires attached with this letter. Contained in the survey are questions about:

Section A: Student Demography
Section B: Generic Skills Scale
Section C: Industrial Placement/Industrial training Experience Scale
Section D: University life and Co-curriculum Evaluation

All information in this questionnaire is completely confidential and no individuals will be identified. Your participation is much appreciated and will contribute to the knowledge and findings to improve the unemployment issue amongst engineering graduates in Malaysia. Your cooperation is much appreciated.
Thank you.

Regards,

HAZMILAH HASAN
Coventry University

If this research needs further requirement, are you willing to participate in an interview survey that will be conducted later? If yes, please write your contact details below for further follow up:

Name:________________________________
Telephone number:(h)____________________ (h/p)____________________
Email Address:_________________________

Section A: Student Demography

1. Age range : 20 – 25 yrs ☐ 2 . Gender: M ☐ F ☐

   26 - 30 yrs ☐

   31 – 35 yrs ☐

   others : ________________

3. Registered Degree Programme :___________________________

4. Nationality : (please specify) _____________________________

5. Working Experience: No Experience ☐
   -exclude industrial training

   Below 1 year ☐

   2 years ☐

   3 years ☐

   above 4 years ☐

6. Please specify type of work experience:

   i. ____________________________
   ii. ____________________________
   iii. ____________________________
   iv. ____________________________
   v. ____________________________

Section B: Evaluation on Generic Skills embedded in Programme modules.

Strongly disagree (1) ⟷ strongly agree (6)	1	2	3	4	5	6
The programme developed my knowledge and intellectual capability.						
The programme increased my creativity ability						
The programme developed my commercial consciousness.						
The programme increased my self control and motivation.						
The programme increased my self confidence tackling unfamiliar problems.						
The programme improved my skills in formal and informal oral communication						
The programme improved my skills in formal and informal written communication						
The programme helped me to develop the ability to socialize at all levels and maintain the relationship						
The programme helped me to develop the ability to work effectively with different groups.						
My programme helped me to develop the ability to plan and complete any project given.						
The programme developed the ability to identify problems, analyze and solve them.						

What was the most valuable session for employability skills throughout your programme? Why?
What was the least valuable session for employability skills throughout your programme? Why?
Any other comments or suggestions?

Section C: Evaluation on Industrial Placement/Industrial training (IT).

Strongly disagree (1) ←→ strongly agree (6)	1	2	3	4	5	6
The industrial training developed my knowledge and intellectual capability.						
The industrial training increased my creativity ability						
The industrial training developed my commercial consciousness.						
The industrial training increased my self control and motivation.						
The industrial training increased my self confidence tackling unfamiliar problems.						
The industrial training improved my skills in formal and informal oral communication						
The industrial training improved my skills in formal and informal written communication						
The industrial training helped me to develop the ability to socialize at all levels and maintaining the relationship through change.						
The industrial training helped me to develop the ability to work effectively with different groups.						
My industrial training helped me to develop the ability to plan and complete any project given.						
The industrial training developed the ability to identify problems, analyze and solve them.						

1. Is the task given in the industrial placement/industrial training appropriate to your academic requirement?
   If yes, go straight to question 2. If no, please specify what are the task given in your industrial training/industrial placement and why?

   ____
   ____
   ____

2. Do the industrial training/industrial placement period enough to build your interpersonal skills or enterprise skills? If no why?

   ____
   ____
   ____

3. In your opinion, what is the best way to transfer generic skills especially interpersonal skills and enterprise skills by industries?

   ____
   ____
   ____

Section D: Evaluation on University life and Co-curriculum Activities.

Strongly disagree (1) ⟷ strongly agree (6)	1	2	3	4	5	6
The university life and co-curriculum developed my knowledge and intellectual capability.						
The university life and co-curriculum increased my creativity ability						
The university life and co-curriculum developed my commercial consciousness.						
The university life and co-curriculum increased my self control and motivation.						
The university life and co-curriculum increased my self confidence tackling unfamiliar problems.						
The university life and co-curriculum improved my skills in formal and informal						
The university life and co-curriculum improved my skills in formal and informal written communication						
The university life and co-curriculum helped me to develop the ability to socialize at all levels and						
The university life and co-curriculum helped me to develop the ability to work effectively with different						
My university life and co-curriculum helped me to develop the ability to plan and complete any project						
The university life and co-curriculum developed the ability to identify problems, analyze and solve them.						

What was the most valuable session throughout your university life that can convince you to be employed?
What was the least valuable session for employability skills throughout your university life? Why?
Any other comments or suggestions for a quality generic skill transfer throughout the university life? Why?

APPENDIX 3- Letter of consent and employer GTQ questionnaire

18/5/06

Faculty of Engineering and Computing
Coventry University
United Kingdom

Dear respondent,

Project title: Exploring Engineers Employability Competencies Through Interpersonal and Enterprise Skills.

I am a PhD student at Coventry University. My Director of study is Mr. Ian Dunn, Associate Dean of Faculty Engineering and Computing, Coventry University. The purpose of this study is to explore if unemployment amongst engineering graduates in Malaysia, is caused by interpersonal and enterprise skills competencies: to investigate if the engineering undergraduates had received a quality placement/industrial training (appropriate to their learning knowledge and employability skills) and recommend solutions to enhance interpersonal and enterprise skills competencies amongst Malaysian engineering undergraduates.

I'm pleased if you could spend 10-15 minutes of your precious time to respond to the questionnaire attached with this letter. Contained in the survey are questions about:

Section A: Company demography
Section B: Generic Skills Scale
Section C: Ranking of Generic Skills importance

All information in this questionnaire is completely confidential and no individuals or company will be identified. Your participation is much appreciated and will contribute to the knowledge and findings to improve the unemployment issue amongst engineering graduates in Malaysia. Your cooperation is much appreciated.
Thank you.

Regards,

HAZMILAH HASAN
Coventry University

If this research needs further requirement, are you willing to participate in an interview survey that will be conducted later? If yes, please write your contact details below for further follow up:

Name:____
Telephone number: (h)_____________ (h/p)______________________
Email address: ________________________________

Section A- Employer Demography

1. Name of business:____

2.Business Physical location: ______________________________________

3. Type of business:____

4. Size of the company: please tick (x) one box:

Less than 250 employees; turnover per year less than 25 million ☐

250 employees; turnover per year 25 million ☐

More than 250 employees; turnover per year more than 25 million ☐

5. Business operated since:_____________________________________

Section B- Generic skills scale embedded in industrial training module.

Strongly disagree (1) ↔ strongly agree (6)	1	2	3	4	5	6
The industrial training has developed the trainee knowledge and intellectual capability.						
The industrail training has increased the trainee creativity ability						
The industrail training has developed the trainee commercial consciousness.						
The industrail training has increased the trainee control and motivation.						
The industrail training has increased the trainee confidence tackling unfamiliar problems.						
The industrail training has improved the trainee skills in formal and informal oral communication						
The industrail training has improved the trainee skills in formal and informal written communication						
The industrail training has helped the trainee to develop the ability to socialize at all levels and maintain the relationship						
The industrail training has helped the trainee to develop the ability to work effectively with different groups.						
industrail training has helped the trainee to develop the ability to plan and complete any project given.						
The industrail training has developed the trainee ability to identify problems, analyze and solve them.						

What was the most valuable session for employability skills throughout your industrail training programme? Why?
What was the least valuable session for employability skills throughout your industrail training programme? Why?
Any other comments or suggestions?

Section C- Ranking of Generic Skills importance

Please rank (1-11) the generic skills given below according to the company needs.

Generic skills	Rank of importance
Intellectual capability	
Commercial consciousness	
Ability to learn	
Socially flexible	
Self control, motivation and confidence	
Formal and informal oral communications skills	
Written communication skills	
Interpersonal skills-face to face interaction; ability to socialize to all levels and maintain the relationship	
Teamwork, ability to work effectively with different groups and ability to complete any project given.	
The ability to identify problems, analyze and solve them.	
Creativity and innovation	

APPENDIX 4a-Student interview questionnaires

Student Interview question

1. What is your plan when you graduate?

2. (If the answer is looking for a job)How would you do that?

3. What was the most valuable session throughout your university life that will help you to gain employment? How long will you give yourself to search for employment? Why?

4. Did the programmes and modules meet your expectations as to the job market requirements? Please explain?

5. Does the industrial training/industrial placement help to build your employability skills?

6. Are interpersonal skills and enterprise skills important during the industrial training? Please explain?

7. If there are two excellent engineering graduates in a job interview, what will be the employer strategy to choose one of them?

8. What do you think about unemployed engineering graduates in Malaysia? Why are they unemployed?

9. Any other comments or suggestion that you would like to add?

Thank you.

Appendix 4b: Student Interview Result

Question	Respondent 1	Respondent 2	Respondent 3	Respondent 4	Respondent 5	Respondent 6	Respondent 7	Respondent 8	Researcher Comment
What was the most valuable session throughout your university life that will help you to gain employment?	-thesis topic -help from Head of Depart., list of companies. -involve in organizing conference; built networking	-program met job requirement. -co-curriculum activity -should polish interpersonal & enterprise skills	-Practical training; learn to organize work and people at diff. level.	-industrial training. -involve in organize lots of program; have networking.	-university program -co-curriculum activity; learned managing people.	-attend job seminar. -represent university in sport.; leadership skill	Not looking for job yet.	-practical training.	
Did the program and modules meet your expectations as to the job market requirements? Please explain?	-most subject are related; but software not up to date	-yes it meet to job market; but project management not usage of programming skill.	-yes, interior contractor during industrial training.	-yes but to much of calculus; in real life not much calculus.	-yes cater the market need.	-yes; same requirement with job advertisement.	-exam oriented and insufficient practical session	-not related to afterward job market but basic knowledge, project, then we utilize the knowledge for sophisticated project in future. -co-curriculum activity	
Does the industrial training/industrial placement help to build your employability skills?	-yes	-yes but there are some not getting the appropriate task.	-yes	-yes through time	-yes	-yes	-yes	-yes	
Are interpersonal skills and enterprise skills important during the industrial training? Please explain?	-yes	Both are important because you will work with other people or in team.	-yes; During industrial training, meet different kind of people such as sub-contractor, supplier, labour and as a leader there, I have to organised their work and communication independently and solve problem.	Yes; learn to communicate with superior which not learn in university and solve problem and more creative than others.	-yes with this skills can go up faster and engineers should have multi skills.	-yes lots of communication and solving problem.	-yes it is important not only to engineers but to all jobs.	-yes important especially in teamwork project.	
Any other comments or suggestion that you would like to add?	University level- introduce interpersonal skills and enterprise skills;not shy to communicate - should have the grooming class i.e. social interaction. Company level- more relationship with university. Student level- make themselves marketable.	final year students should look what the market really want, employer must not so strict to take experience people. Employer avoid to take female engineers because they are worried cannot work during night. But the issue here is safety. If the employer can guarantee safety, there shouldn't be a problem.	Engineering program in Malaysia should be specialized, now it is too general *tapi ikut kehendak* (but follow the need of) market.	Industrial training should be extend to 6 months.	Engineering field is still in demand. I don't think that as an engineer you will end up with no job.	-no	The education system is exam oriented. I do hope that one day that our education system is more balance theory and practical must be balance. Thank you.	University should provide more practical session. I already have partnership business, so far we can communicate well with all level.	

Appendix 5- Employer Interview Questionnaire

1. What is your opinion of industrial training?
2. With which universities do you participate in conducting the industrial training or industrial placement?
3. How long is the industrial training that takes place in your company? Is this duration request from the higher education institution or the company?
4. What are the industry needs or requirements from the engineering graduate?
5. In recruiting engineers, is the company practice to select on the degree or are generic skills more important? Please explain?
6. This study is exploring if the cause of unemployment amongst engineering graduates is because of a lack of interpersonal skills or enterprise skills. What is your comment regarding unemployment amongst engineering graduates?
7. Is there any priority or importance placed on generic skills in your company?
8. Is the task given in the industrial placement/industrial training to the trainee appropriate to employability and academic requirement?
9. Is there any better way in transferring the employability skills to the engineering graduate?
10. What are the future needs of industry?
11. Other comments regarding engineering employability you would like to add.

Thank you.

APPENDIX 6- MEAN COMPARISON BETWEEN FACULTIES

Degree		The industrial training increased my self confidence tackling unfamiliar problems	The industrial training improved my skills in formal and informal oral communication	The industrial training improved my skills in formal and informal written communication	The industrial training help me to develop the ability to socialize at all levels and maintain the relationship	The industrial training developed my knowledge and intellectual capability	The industrial training increased my creativity ability	The industrial training developed my commercial consciousness	The industrial training increased my self control and motivation	The industrial training help me to develop the ability to work effectively with different groups	The industrial training help me to develop the ability to plan and complete any project given	The industrial training developed the ability to identify problems, analyze and solve them
Mechanical	Mean	4.9130	4.9420	4.7681	5.0725	4.9275	4.7536	4.9420	4.9855	5.0000	4.9130	4.9420
	N	69	69	69	69	69	69	69	69	69	69	69
	Std. Deviation	1.06742	.87252	.94160	.79185	.95976	1.00595	.80228	.93136	.93934	1.05355	.83814
Civil	Mean	4.8961	4.9351	4.8182	4.8517	5.0649	4.5844	4.8571	4.9091	4.9610	4.9091	4.8571
	N	77	77	77	77	77	77	77	77	77	77	77
	Std. Deviation	.91168	.95059	.91374	.95579	.87866	1.05569	.82261	.86118	.84979	.89121	.91356
Electrical	Mean	4.7073	4.7886	4.4553	4.9024	4.7398	4.5285	4.5854	4.6260	4.8455	4.6748	4.7317
	N	123	123	123	123	123	123	123	123	123	123	123
	Std. Deviation	1.03806	1.02631	1.05000	.92696	1.08520	1.08133	1.09340	1.05114	.92358	1.10510	1.07179
Total	Mean	4.8141	4.8699	4.6394	4.9331	4.8810	4.6022	4.7546	4.7993	4.9182	4.8030	4.8216
	N	269	269	269	269	269	269	269	269	269	269	269
	Std. Deviation	1.01243	.96670	.99630	.90355	1.00408	1.05526	.96159	.97957	.90645	1.03765	.97245

Note: The mean differences are not significant between faculties. Therefore, the researcher considers respondents as a group of undergraduate engineers.

APPENDIX 7- 1ST RUN OF EXPLORATORY FACTOR ANALYSIS

Rotated Component Matrix(a)

	Component				
	1	2	3	4	5
dconfdt	.865				
didntfy	.856				
dmotiv	.851				
dplan	.831				
deffec	.831				
doral	.819				
dsocia	.806				
dintelec	.805				
dcretiv	.804				
dwriten	.731				
dcomcil	.713				
cconfdt		.871			
cplan		.863			
cmotiv		.853			
cidntfy		.834			
ceffec		.818			
coral		.795			
csocia		.793			
ccretiv		.780			
ccomcil		.756			
cintelec		.756			
cwriten		.752			
bcretiv			.765		
bcomcil			.758		
bmotiv			.748		
bintelec			.738		
bconfdt			.620		
bsocia			.620		
bidntfy				.759	
bplan				.736	
beffec			.501	.583	
bwriten			.501		.568
boral			.539		.546

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
(a) Rotation converged in 6 iterations.

Note: There is 2 overlap results (bwriten and boral) shows of overlap in terms of meaning. Therefore, researcher decided to take out both (bwriten and boral) to get a 'clean' result and run a second Rotated Component Matrix.

Appendix 8: Generic Skills Scale Embedded in Employer Industrial Training

Respondent	Most valuable	Least valuable	Comments
1-I.T.M.S.B.-semiconductor	Familiarization & mentorship program	When engineer cannot accommodate in his/her familiarization program	We have training programs to grab all these skills. However it is not meant for trainee.
2-A.M S. B. - aircraft maintenance & service	On job training environment & working exposure	Student should be able to give ideas or feedback to the organization that they attached in terms of suggestion for improvement as to create innovative mind as a future leader and human capital for the country.	Immediate lecture should be able to assess their student's generic competencies and the detail should be part of the application for the use of the organization that they will be attached. This will encourage the student ability starting from the university life in to the organization.
3-D.I.M.S.B.-manufacturing	Exposure to the real life-working environment which is different from classroom/lecture hall environment	None	Leadership capability is vital
4-P.D.B.-oil business	Increase self confidence	-	-
5-D.I.D- Tunnel Construction	When the trainer exposed to the real construction works and they understand well how the process of tunnel construction.	-	-
6. J.M.G.- Housing Developer	-	-	-
7.S.P.S.B.-manufacturing	New knowledge about the industrial process and improve social communication with peoples	none	-
8.C.O.M.S.B.-manufacturing	Additional help for the company	Long familiarization period	-
9. R.W.E.M.S.B. - electronic manufacturing	Learn about machine mechanism and function.	Actively involve in team work by working and questioning maintenance group	Trainee not well prepared to accept the industrial environment. Sometimes seemed a bit lost.
10. U.I.I.S.B.-pressure gauge manufacturing	Actual contribution toward the company by using exist resource provided	The attitude of the trainee and willingness to work together under the training session should improve.	No.
11. H.E.S.B.-automation & control solution, industrial process	The chance to learn from experience engineers	There is no least valuable session throughout the industrial training. Trainee must see themselves as the real graduate engineers.	Trainees must have an 'I-want-to-learn' attitude, aware of what is expected of them, deliver the job in given times and must speak & write very good clear English.
12. T.N.B. -generate electricity	Hands-on	Nil	Nil
13. P.T.P.S.B. - Sea port container handling	Learning by actually doing it & learn from mistakes	Accountability on the expected/desired deliverable	Developing leadership skills via effective communication
14. M.A.S.B. - airline engineering	Actual performance of allocated tasks	If there happen to have a work stoppers for whatever reason	-
15. P.M.S. B.-automotive industry	The experience of working at site (shop floor)	Knowledge of problem solving in real situation, analyze, and the result.	The period of training contribute the process of learning and improve skills. The most suitable time for industrial training is about 5 to 6 month.
16.C.C.M.F.S.B. - fertilizer manufacturer	-	-	-